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Original Communications.[1]

HYPERSENSITIVITY OF DENTINE AND ITS TREATMENT.[2]

BY HENRY H. BURCHARD, M.D., D.D.S., PHILADELPHIA.

The study of disordered or exalted function of any part is logically preceded by a study of the normal function and relations of the part.

Investigations as to the sources of sensation itself, and a parallel study of the mechanism of sensation, divide the nervous system into three parts, so far as the study of anæsthesia is concerned. The first factor involved is a receptive apparatus, or that through which sensation is primarily received; the second is perceptive, or the anatomical region in which there arises consciousness of sensation; the third considers the pathway or the mode of transmission from the first to the second.

The first, the receptive apparatus, includes the several nerve-endings of sensory nerves; the second, the path of transmission, includes the nerve-fibres and nerves which begin in these endings and pass into the posterior columns of the spinal cord, if spinal nerves, or through corresponding paths if they be cranial nerves, and have their apparent physiological endings in the perceptive

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[1] The editor and publishers are not responsible for the views of authors of papers published in this department, nor for any claim to novelty, or otherwise, that may be made by them. No papers will be received for this department that have appeared in any other journal published in the country.

[2] Read before the Academy of Stomatology, Philadelphia, November 24, 1896.

areas of the brain,—areas in the right and left hippocampal regions. Sensation may be defined as a stimulus received by a receptive nerve-ending, transmitted by the path named to this area when it becomes translated into conscious sensation.

Stimuli, productive of what is termed normal sensation, may be regarded as a definite quantity; an increase in the degree of stimulation is productive of disordered sensation, and if the degree be high enough give rise to what is termed pain. It is not absolutely necessary that the stimuli producing pain be received by the terminals, whose function is the reception of such stimuli. The clinical records of medicine and of dentistry afford numerous instances in which the stimulus causing pain has been received at some portion of the transmitting apparatus. This factor needs no further comment at this point, as its study is the study of surgical neuralgia; suffice to say that when the source of irritation is in some portion of the transmitting apparatus, the perceptive centre may refer the sensation to any portion of the distribution of the nerve affected, which states that the farther from the proper receptive apparatus the cause of irritation is, the more difficult it is to locate the cause.

As pointed out and elucidated by Dr. Black ("American System of Dentistry," vol. i.), organs which have no tactile receptive organs proper have, as a rule, stimuli received by their nerve terminals referred to other parts; in a word, they are distinguished by reflected sensations. The dental pulp is such an organ, and it is in the experience of every dentist that irritation beginning in exposure of the dentine periphery of a tooth and ending in degenerations of the pulp itself are not precisely located, but are referred to other parts, usually to some portion of the fifth cranial nerve.

Although the mutual interactions which physiologists and pathologists describe as occurring between disordered sensation and nutrition are of direct clinical interest, their discussion is beyond the province of the present essay. Nor is the discussion of relative perception in order; hypersensitivity of dentine is defined as such a condition of æsthesia of dentine as precludes the cutting away of such an amount of dentine as required for the perfect preparation of a cavity for filling. What difference in the irritability there may exist in the dentine of different individuals, or whether the differences are psychical, will form no factor in our studies. We simply accept that the objective evidences of pain evinced in subjective signs may be divided into groups,—*i.e.*, there is evidence of wide differences as the sensitivity of the dentine.

Reverting to the statement that there are three factors concerned in sensation or æsthesia, it is a corollary that the same three are concerned in the induction of anæsthesia.

The first of these that has the widest range of effect is, of course, the perception, for, although pain, or rather the conditions of pain, may exist objectively, they have no existence subjectively until the perceptive centre takes cognizance of them, and it follows, therefore, that if the function of perception be abolished no pain can be felt, no matter what irritants may be applied to the receptive or transmissive apparatus. The first great means, therefore, of destroying or preventing pain is holding in abeyance the function of the perceptive centre. Agents which have the power to accomplish this end are comprised in the classes of general anæsthetics and general anodynes.

Of general anæsthetics, the inhalation of chloroform, of ether, and seldom of nitrous oxide have been employed to lessen the perception of the irritation caused by the cutting of hypersensitive dentine. Chloroform is, of course, excluded from dental practice as an anæsthetic, even when used in small amounts, owing to its attendant dangers.

Dr. Bonwill has stated to the writer that as early as 1855 he has practised chloroform inhalation as a means of procuring dentinal insensitivity.

The vapor of ether has been employed with marked success. It should be noted in this connection that the apparatus devised by Dr. Fillebrown, shown at one of our meetings last year, materially broadens the field of the usefulness of ether in this immediate direction.

Of general anodynes two have been used which act upon the perceptive centre.

The first of these is morphine, which, for the specific purpose under discussion, is combined with atropine, which lessens its soporific effect without diminishing the anodyne property; the amounts of the drug used are,—

℞ Morphiæ Sulph., gr. $\frac{1}{8}$;
Atropiæ Sulph., gr. $\frac{1}{150}$. M.
Sig.—Half-hour before operating.

The administration of this prescription has materially lessened the pain incident to the cutting of hypersensitive dentine. The next of the general anodynes are the coal-tar derivatives. Acetanilide is taken as the basis of these; the general effects of the pro-

prietary preparation called antipyrin, and also of phenacetin, and acetanilin are almost alike. The basal drug is combined with others which modify its effects, preserving, however, its two great properties, pain and temperature reducing. Perhaps the best of these preparations is ammanol, which, containing ammonium carbonate, removes any unpleasant symptoms referable to the heart.

The dose, ten grains, administered one-half hour before operating, has been found to reduce the perception of dental pain in some cases, the drug acting as morphia upon the perceptive centre.

Under this heading the induction of the hypnotic state to prevent pain perception belongs, as hypnotism is essentially the directing of psychic perception, so that the functions of the lower centres are placed under domination. Whatever conception and classification the psychologist may have as to hypnotism, this is its function in our immediate practice. I pass over this subject without comment, owing to a feeling of indecision as to the ethical side of it, not owing to any doubt as to its effectiveness.

The rapid respiration method of Bonwill should also be included under the head of general anæsthetics.

The next class of agents are those acting upon the apparatus of transmission. Two drugs may be selected for example in this connection, the first, the coal-tar derivatives, just discussed, which appear to interfere with the transmission as well as the perception of pain; the second, cocaine.

In order to secure this effect with cocaine it is necessary that it be brought into contact with the apparatus of transmission. This end may be accomplished in two ways, the first the direct injection of a solution of cocaine near the apparatus of transmission or its introduction to the nerve trunk by means of the cataphoric current.

The first of these means has been tried with a varying degree of success, the second is still open for experiment. It cannot be too strongly emphasized that in the injection of cocaine for operations about the mouth, two precautions should always be taken. The first, the careful sterilization of the field of operation, and of the syringe employed; the second, the use of the minimum physiological dose of the alkaloid. The first end is accomplished by first scrubbing the teeth and gums with a soft brush and an antiseptic soap, following this by a spray of hydrogen peroxide or a ten-per-cent. solution of meditrina, the syringe to be soaked well in a five-per-cent. solution of carbolic acid, or in listerine.

The amount of cocaine employed should not be greater than one-eighth grain dissolved in—

℞. Aquæ, ♏xl;
Listerine, ♏xx. M.

It may be remarked that surgical accidents are far from uncommon, following cocaine injections about the jaws. Dr. Cryer has, I believe, some interesting data in this connection.

The third method of destroying or preventing pain is that usually employed by the dental operator for the obtunding of hypersensitive dentine,—*i.e.*, abolishing the function of the receptive apparatus.

We are all perfectly familiar with the fact that any and every agent which has been shown to have the power of lessening pain through local application or of temporarily benumbing nerve terminals has been used for the purpose under discussion. The most prominent of the agents which have been employed may be conveniently grouped under heads, beginning with the mildest agents.

The first means of lessening the irritability of nerve terminals is, of course, the removal of the substance which irritates them. It has long been held, as many of us are aware, that the direct cause of hypersensitivity of dentine is an acid condition, the phrase being applied in a somewhat indefinite manner. In accordance with this belief it has been and is a common practice to use alkaline mouth-washes and apply mild alkalies to the hypersensitive parts, and in many cases marked relief followed. The agents most commonly employed are a mouth-wash of lime-water, and precipitated chalk,—calcium carbonate. In view of our present knowledge of the pathology of caries and of oral bacteriology, it is a perfectly reasonable hypothesis that the source of irritation in early caries is the irritation of the terminal filaments of the dentinal processes by lactic acid; the use of an alkali by neutralizing the acid removes the source of irritation. The lactate of calcium is formed from the chalk instead of from the calcium of the teeth.

The other agents which have been used as obtundents may be included in four groups, according to their mode of action. First, cold; second, heat; third, specific obtundents, and fourth, agents which destroyed the receptive apparatus.

First, Cold.—It is a well-recognized fact in general and special practice that the lowering of the temperature of a part is followed by a diminished functional activity of the part. It has long been known that the literal freezing of a part was followed by an abolition of sensation in the part frozen.

This principle has been made use of in dentistry at earlier periods for the extraction of teeth, and within the past ten years

for the obtunding of hypersensitive dentine; as this variety of dentine, or, more specifically, the dental pulp is peculiarly intolerant of sudden changes of temperature; an apparatus is required which will lessen the temperature by almost imperceptible gradations.

The purpose is accomplished by directing a spray of one of the highly volatile hydrocarbons against the exposed dentine. Rhigolene, ether, and chloroform, which had former employment in this connection, have been superseded by more volatile agents,—those having a less molecular weight,—ethyl and methyl chloride and pental. These agents, although general anæsthetics, are too volatile and evanescent to be generally serviceable in that direction. The bottle or vial in which the liquid is contained constitutes the apparatus required after isolation of the tooth by rubber dam. In some cases a degree of insensibility may be produced which will permit the painless exposure or even extirpation of the pulp.

The rapid vaporization of liquid nitrous oxide may be utilized in a similar manner.

Second, *Heat.*—Heat, as dental practice testifies, is an obtundent agent, acting not as cold or as a specific analgesic, but in virtue of its drying property, which states, of course, that dry heat is to be used.

It is applied as blasts of dry, hot air by means of appropriate apparatus after the tooth has been isolated. Dr. Register introduced some years ago a method and apparatus with which many of us are familiar, by means of which a blast of hot, dry air was forcibly driven against the walls of hypersensitive dentine, and produced a marked obtundent effect. Members of the State Dental Society will recall an able and instructive paper written by Dr. C. V. Kratzer upon this subject. It is very probable that the contents of the dentinal tubuli are shrunken through being deprived of a portion of their water, and thus are prevented from performing their normal function, the reception of stimuli.

The next means of applying heat as an obtundent might, perhaps, be more properly classed under those agents which destroy the receptive mechanism. It is by applications of hot burnishers, the method being followed only in those cases of hypersensitivity of the dentine upon the periphery, such as the abraded masticating surfaces of the teeth. The dental cautery has also been used for the same purpose; the loop of platinum, made almost white hot, is passed over the hypersensitive spots.

Third.—The next class of agents or measures used are those which chemically destroy the receptive apparatus. Under this

head are included the powerful cauterants, such as zinc chloride, silver nitrate, the mineral acids, and strong alkalies, carbolic acid, creosote, and allied substances, and chromic acid. Some of these agents, such as chromic acid, zinc chloride, aqua ammoniæ fortior, sodium carbonate and hydrate, are notably hygroscopic, abstracting water from bodies with which they are brought in contact; most of those named abstract water as water from the tissues; still others of the group, notably sulphuric acid, has such an affinity for water that it extracts the elements of water from even solid carbohydrates,—as, for example, when brought in contact with sugar, a stable chemical compound, where the water does not occupy the position of water of crystallization, but is an integral part of the compound itself; sulphuric acid extracts the elements of water and leaves the carbon,—

$$C_6H_{12}O_6 + H_2SO_4 = H_2SO_4 + 6H_2O + 6C.$$

The activity of these bodies depends upon the strength of the affinity for water, sulphuric acid heading the list, and the least deliquescent substance at its foot. Another factor is, however, to be taken into consideration,—viz., the chemical reaction between the obtundent or active chemical agent and the protoplasm traversing the dentine. The effect of sulphuric acid has been noted. The powerful alkalies have the power of dissolving protoplasm or making a solution in which the character of the albumen is profoundly altered.

The metallic salts, zinc chloride, and silver nitrate enter into combination with the albumen, forming bodies indefinitely known as albuminates of the several metals; carbolic acid and allied substances have an analogous power,—in other words, they effect the coagulation of the albumen present. The extent of this coagulation may be seen in a series of experiments of Dr. James Truman (International Dental Journal, January, 1895). The results of this series of experiments are of direct practical interest and clinical application. As stated under the heading, agents which effect coagulation produce a chemical change in the contents of the dentinal tubuli, which means their destruction,—that is, the destruction of the terminals of the receiving apparatus.[1]

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[1] I noted once in an essay or discussion—whose I cannot recall—a statement which implied that zinc chloride and perhaps other hygroscopic salts possessed the power of abstracting water from even the basis substance of dentine. The statement is without foundation. The zinc salt certainly possesses a strong

The parts to which these agents are applied become anæsthetic because of the necrosis induced. Viewing the reaction as a matter of chemistry, it is, of course, evident that the extent or depth of the coagulation will depend upon the amount of coagulant used and the length of time of application.

It is needless to enlarge here upon the general clinical experience that the use of the destructive agents is frequently necessary. As a group these agents comprise a class which finds clinical application only when milder means of obtaining sensitivity have failed; and, again, the agents which effect the least chemical alteration are employed before applying those of greater chemical activity. For example, carbolic acid or one of its derivatives, if found ineffective, would be succeeded by applications of sodium carbonate, and next by zinc chloride.

Another hygroscopic preparation should receive at least mention in this connection,—that is, the glycerole of tannin. Both ingredients of this prescription exert their specific effects in obtunding.

There is a point in the investigations and experiments of Dr. Truman which is of great significance,—*i.e.*, it has always been believed that silver nitrate was very superficial in its effects. The experiments as to its effects in coagulation have shown it to be one of the most penetrating of coagulants. This finding will necessarily modify our opinions as to the therapeutic use of this salt. I do not enter into the question of the diffusibility of coagulants, Dr. Kirk's experiments and evidence having shown that the first layer of coagulum formed by contact of albumen and a coagulant does not prevent the passage of the latter through the coagulum; that the question is one of chemical affinity more than of physical diffusion.

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affinity for water where it exists as water, but that it can decompose the basis substance of dentine is, of course, not true. The same essay, if I recall the statements correctly, implied that zinc chloride possessed such an affinity for water that it continued its action until its affinity in this direction was unsatisfied,—*i.e.*, to an indefinite dilution. This, if generally believed, is a serious error. Such a belief implies that, if, say, one hundred grains of zinc chloride (fused) were added to a solution of albumen, say ten thousand grains, the fluid found after the disappearance of the solid salt would still contain the one hundred grains of chloride diluted by the water of the solution and of the albumen; that the coagulum which is formed would be formed in consequence of the abstraction of water by the salt. As a matter of fact, the amount of salt in solution would be found to be diminished by just the amount required to form the albuminate of zinc, so that if there be an excess of albumen the zinc will have disappeared from the solution and may be recovered from the coagulum.

The last class of agents used for the purpose under discussion are those which benumb or temporarily abolish the function of the receptive apparatus, these form the group of the obtundents proper. So far as clinical evidence is concerned, these agents act as specific obtundents without demonstrably altering the structure of the parts to which they are applied.

This sentence of course is to be accepted in its broad sense, for it is probable that some chemical reaction does occur between drugs and protoplasm which it is beyond the resources of experimental pharmacology to determine.

Nearly all of the agents of this group are included in the essential oils and the powerful alkaloids. Chloroform should be mentioned, however, as possessing the obtundent property.

The essential oils were probably among the first agents to find employment, if not for this specific purpose, they were at least applied for the relief of other dental pains. Those found to possess marked obtunding properties are the oils of cloves, cinnamon, gaultheria, thymol, myrtol, and several others. Of these, thymol appears to be the most effective. Their effectiveness, as a rule, increases in the degree that the pulp is approached.

Before passing to a discussion of the uses of the alkaloids in this connection, space should be accorded the mechanical means of preventing, not obtunding, pain,—that is, the rapid, light, and interrupted cutting of the dentine by means of perfectly true and perfectly sharp burs. The physical injury implied is marked by less irritation under this means than when dull or untrue burs are used.

The alkaloids which have been employed as obtundents are veratria, aconitia, atropia, and cocaine. While all of these bodies have been found to reduce the sensitivity of an exposed tooth-pulp, when applied locally to the dentine itself, the analgesic effect has not been sufficiently marked to term them obtundents so far as hypersensitive dentine is concerned.

The nearest approach to such an effect being noted in connection with cocaine; to secure the obtunding effect in favorable cases, the ordinary solutions, even saturated, have been found inefficient, the cocaine crystals are made into a thick paste with glycerin and applied to the dentine. Dr. F. D. Gardiner has, I believe, the records of success with this method.

The other alkaloids named have been used in weak solution, rarely in strong preparations, owing to the danger of toxic effects should such powerful agents get into the mouth and be swallowed. They are, therefore, in view of the risk involved, deemed dangerous

agents for dental experimentation; although aconitia and veratria are powerful analgesics, even in small doses.

As these alkaloids are applied to act upon the terminals of the dentinal fibrillæ, when used in combination with the powerful coagulants, it is impossible to determine which agent has induced the analgesia.

Another agent which has been employed as an obtundent is fitly placed in a class by itself. I allude to arsenic and preparations which contain it. That this agent will most certainly destroy entirely the sensitivity of the dentinal fibrillæ is beyond a question, but there is good evidence that its application, even for short periods, is almost invariably followed by death of the pulp itself. Application of arsenic at a distance from the pulp is followed in some instances by throbbing pain, which would seem to indicate that a reflex hyperæmia had been induced; in other cases no sensation whatever is produced, and yet paralysis and degeneration of pulp-tissue, characteristic of the action of arsenic, are found to occur.

Dr. Henry C. Register has found that Fowler's solution, the liquor potassii arsenitis, has the power of promptly and certainly abolishing the sensitivity of the dentinal fibrillæ; it is presumed that, as with arsenous acid, the effect is necrotic.

Although the obtundent effect of arsenical preparations is undoubted, almost universal opinion debars their use, except in cases where the inevitable pulp devitalization is desired.

The next agent to be considered as an obtundent is the electric current itself. It is a well recognized fact in medical practice that the constant or galvanic current has the power of alleviating pain; it has been in general use in medicine for the treatment of various neuralgias, its minimum of success attending its application in neuralgia of the trigeminus. The interrupted current was used in the fifties to render painless the extraction of teeth, and successfully in a proportion of cases.

Dr. W. G. A. Bonwill states that in 1859 he procured a patent for an induction apparatus with a constant current, for the production of dentinal analgesia.

In the *Dental Cosmos*, 1875, Dr. J. Foster Flagg described a primary induction apparatus which he had used previously, and does use to the present day for the obtunding of the hypersensitivity of dentine. Experiments with this apparatus, which he terms the dental, have shown that it induces insensitivity of hyperæsthetic dentine in a very few minutes.

The latest development in this field, or, as it might be more accurately denominated, the readoption of electrical osmosis, has occupied the space it deserves in journalistic literature. To this literature the writer has nothing new to add except a belief in the benign influence of cocaine carried into the pulp by such means; however, in consideration of the fact that constant currents in themselves have been shown to exert an analgesic influence, it would be interesting if those who are experimenting with the cataphoric current were to try its effects without the addition of the cocaine.

An essay upon the present subject should naturally touch upon, if not discuss, the nature of the nerve terminals of the dental pulp. Whatever anatomical connection there may be, and I believe it to be a close one, between the odontoblasts and the plexus of nerve-fibres immediately underlying them, it is certainly true that, so far as physiological function is concerned, the odontoblastic processes behave like sensory nerve terminals. It is my expectation that with growing refinement of histological technology it will be found that the terminals of these nerves are in the odontoblasts themselves, I cannot see any other explanation of the phenomena observed in hyperæsthetic dentine.

THE VALUE OF STATISTICS IN CATAPHORESIS.

BY L. E. CUSTER, B.S., D.D.S., DAYTON, OHIO.

The December, 1896, number of the International Dental Journal contains a record of forty cataphoric operations by Dr. Louis Jack. Considerable time and care must have been given to obtain the data recorded, and while the effort is certainly commendable, we do not see that the data are of much practical benefit to other operators, or of much value in establishing rules and tables for reference for his own or the use of others operating even the same appliance, unless he can convert the number of cells and the contact points of the rheostat into volts.

The variations both in the manner and means of applying the current and in the cavity are of such wide range that it will always be difficult to obtain accurate data in these operations, and yet if we are to make a success of cataphoresis we must make these records and learn what we can from them.

By the title of the paper Dr. Jack does not intend that they should be more than notes on cataphoresis, and yet these notes could be made of great value if, instead of giving the number of cells and the pins of the rheostat, he had given the pressure in volts as measured on a standard volt-meter.

The voltage of the different cells on the market is not the same, nor does the voltage of a single cell remain the same during all its life. By the construction of a cell and its elements there may be a wide range in the voltage. A Smee or a Walker cell will produce an electrometric force of but half a volt, while a chromic acid, or a Fuller cell, would give two volts or four times the former. This shows that it is important to know the kind of cell being used.

Again, the chemical action going on in any given cell is not the same at all times. In some cells there is a steady voltage for a time, and then a gradual decline. This is characteristic of open circuit cells. In a dry cell there appears to be a "warming up" of the chemical process, and with it a rise in the voltage followed by a drop. At the close of the life of any cell there is always a lower voltage than when the cell was new.

The rheostat used for controlling the current is also liable to variation. This is especially true of water and graphite instruments for this purpose. Water becomes a better conductor as it heats, while all metals act in just the reverse. This property of metals, except in the case of iron, is scarcely appreciable, but with water it is somewhat marked. The form of graphite rheostat, in which this material is contained in a powdered form in a flexible receptacle is even more uncertain than water, and those rheostats which are made of a thin coating of graphite upon slate or the like are not to be used at all unless a volt-meter is used with them.

Then, again, the conditions which pertain to the patient and the method of applying the current are important factors in securing reliable data. It was shown in a paper read before the March meeting of the Mississippi Valley Dental Society that the enamel is not a conductor of electricity; that it covers the dentine as an electrical insulator, about equal to so much porcelain. The dentine is a conductor only by virtue of the moisture contained in its tubuli, and anæsthesia is produced only in the fibrils contained in those tubuli whose mouths open into the cavity. The fibrils in those tubuli covered by enamel only become anæsthetized when the cocaine has reached the pulp through the exposed tubuli. We might say that, except where there is a very little penetration of the current laterally at the interzonal layer, unexposed dentine

can only be anæsthetized reflexly. To do this the cocaine must be carried entirely through the dentine and the coronal portion of the pulp infiltrated.

Now, since the electric current, in flowing from the positive to the negative through the patient, flows through what we might call a constriction equal to the area of exposed dentine, and since no more can flow under a given pressure in volts than can pass this point, it is evident that the exposure of dentine and the distance to the pulp alone determines the current in ampères which will flow. Of course there is resistance between the pulp and the negative electrode on the cheek or hand, but that is so very small as compared to that offered by the dentine as to be negligible. A small cavity with a small area of dentine exposed under eight volts would allow, say, one-tenth milliampère to flow, while a large cavity under the same pressure would allow perhaps five-tenths milliampère. There is a distinct proportion between the area of exposed dentine and ampères under the same pressure in persons of about the same age.

The distance from the pulp—that is whether the cavity is shallow or deep—is a feature which relates more especially to the volts that may be attained than to the ampères. It will require a higher voltage in a superficial cavity than in a deep one, because the resistance is greater. This, at the same time, means that with a high voltage in a superficial cavity no more is accomplished than with a low voltage in a deep cavity, and it accounts for the length of time, and often the high voltage, required in this class of cavities.

That condition of dentine which has been long exposed to abrasion, and is without sensation, is much like enamel electrically. The tubuli have been filled in with lime salts, and it is almost a non-conductor. It is only when the deeper and sensitive layer is reached that we have the principal condition for cataphoresis,—namely, conductivity. Dentine of this character will offer greater resistance than freshly exposed dentine of young persons, and this must be borne in mind in the measurement of current.

The negative electrode should always be placed at the same part of the body, because, as has been shown by Dr. Price, there is a difference of from three thousand to five thousand ohms resistance between the cathode upon the cheek and upon the hand. It is desirable to keep the voltage down, and consequently the most desirable position for this electrode is upon the cheek.

There are so many variable conditions in the operation of cata-

phoresis that I do not think it is possible to previously estimate, with accuracy, the number of volts and ampères that a given case under operation will require, and yet by the tabulation of our cases, just as Dr. Jack has done, except that standard measuring instruments be used, I believe we will, after a little experience, be able thereby to tell just when we have gone far enough with the current. We will learn just what the requirements of each case will be, and can tell how nearly we are filling these requirements.

A STUDY OF THE RELATION OF THE FRONTAL SINUS TO THE ANTRUM.[1]

BY DR. THOMAS FILLEBROWN, BOSTON, MASS.

My attention was especially called to the relation of the frontal sinus some four years ago, by difficulties I met in inducing a cure in several different cases of empyema of the antrum. In each of these cases the frontal sinus was plainly involved and seemed to be connected with the cause of the antral trouble.

Several of my troublesome cases were sent me by a specialist in the treatment of the nose and throat, whose skill they had defied for over two years.

The paper described five cases, in all of which the conditions of the frontal region showed plainly there was inflammation in the frontal sinus.

One patient had suffered from a disagreeable discharge from the nose for nine years; one for three years, and others for two years or more.

In each case pus continued to gather in the antrum, even when, after washing out thoroughly, examination showed an apparently healthy condition of the lining membrane of the cavity.

Each of these cases I treated by making a good-sized opening through the region of the tooth-sockets, thus affording drainage from the dependent parts of the cavities. In each case teeth had been lost entirely, or only roots remained, so no teeth had to be sacrificed to accommodate the operations.

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[1] Abstract from a paper read before the American Dental Association, Saratoga, August 5, 1895.

Antrum number one was entered through the socket of the second bicuspid.

Number two, through the second molar region.

In number three the absence of the first bicuspid afforded opportunity.

Number four was entered through the sockets of the first molar, and number five through the location of the second molar.

I made the openings as large as a common lead-pencil, and made a hard rubber plug attached by a clasp to a neighboring tooth to keep the artificial canal patulous, and render the atmospheric condition normal. The plugs could easily be removed by the patient, and after cleaning be as readily replaced.

I have tried both the open tube and the solid plug, and much prefer the latter. It is hardly practical to use a canula large enough to syringe through freely and not to also allow the circulation of air, which is not a natural condition.

The plug being easily removed, both plug and cavity can be washed thoroughly clean. A tube cannot be made clean without much trouble.

The results in these cases are as follows:

Number three cured. Has been entirely well over a year. Number five has steadily gained and is nearly well. Number four improved for a year, then sickened and died from other troubles. Number two, of nine years' standing, keeps himself comfortable, with steady but slow improvement. Number one keeps himself comfortable by daily syringing of the cavity. In each case with a probe wound with cotton I could explore the whole cavity and locate any pus-producing spots, or any collection of secretions; and in cases numbers one and five, by passing the probe through the foramen into the nose, I constantly found pus, which was secreted at that point or came down from the sinus above, which I have since found to be entirely probable, as I shall show later.

I have never found any difficulty in inducing a cure of empyema of the antrum in a few weeks when the cause was of purely dental origin. This being the fact, and the frontal sinus in these cases being so evidently affected, led me to conclude that there must be a very much more intimate relation between the two cavities than that described by anatomist or surgeon, for I could find neither an anatomist or surgeon who could give me the least encouragement that my surmise was correct.

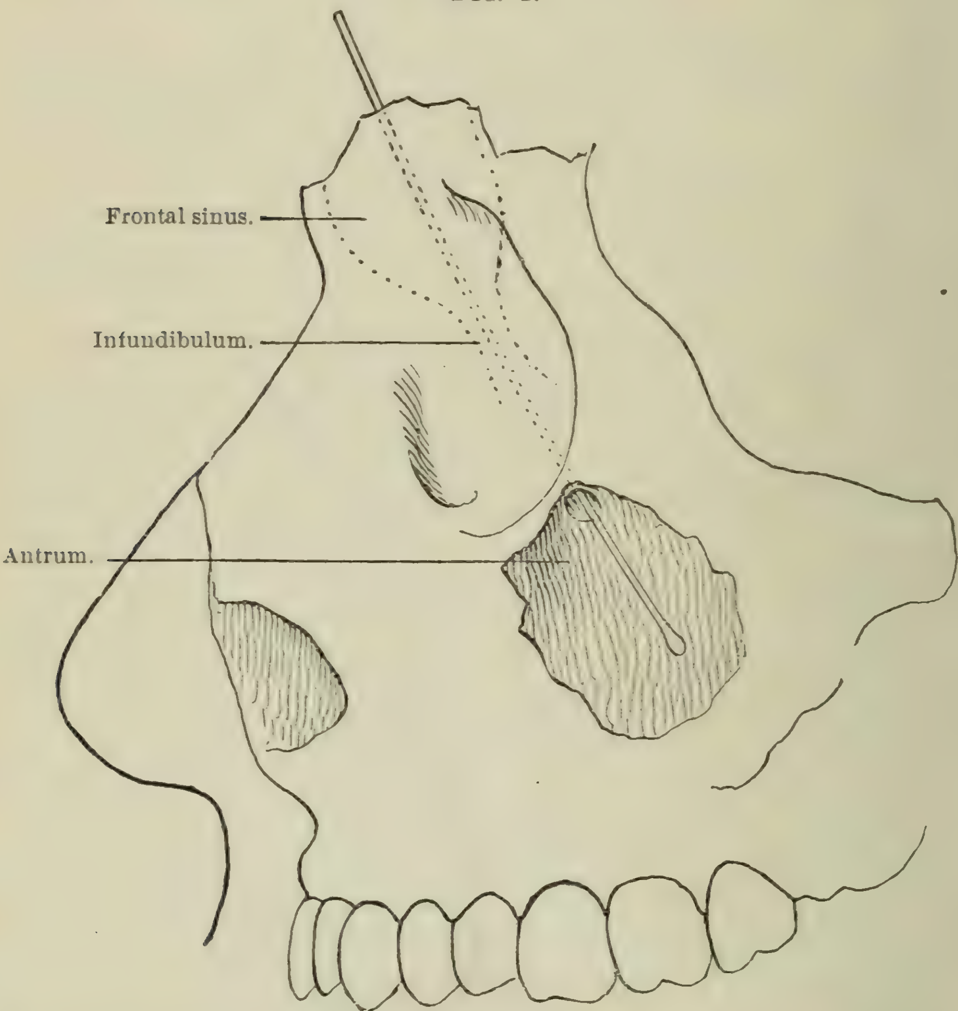
During the past winter I succeeded in verifying my opinion. Professor Dwight, of the Harvard Medical Faculty, kindly offered

me an opportunity to examine several specimens in the Harvard Anatomical Museum, and enabled me to obtain others especially for my purpose, and gave me access to his extensive library.

I believed the infundibulum had some direct connection with the antrum, and discharged its secretions directly into it, and an examination of eight different specimens showed that to be the case.

The infundibulum, instead of terminating in the middle meatus, continues as a half-tube, and this half-tube terminates directly in the foramen of the maxillary sinus. This was the case in all of the eight specimens, and in seven of the specimens there is a fold of

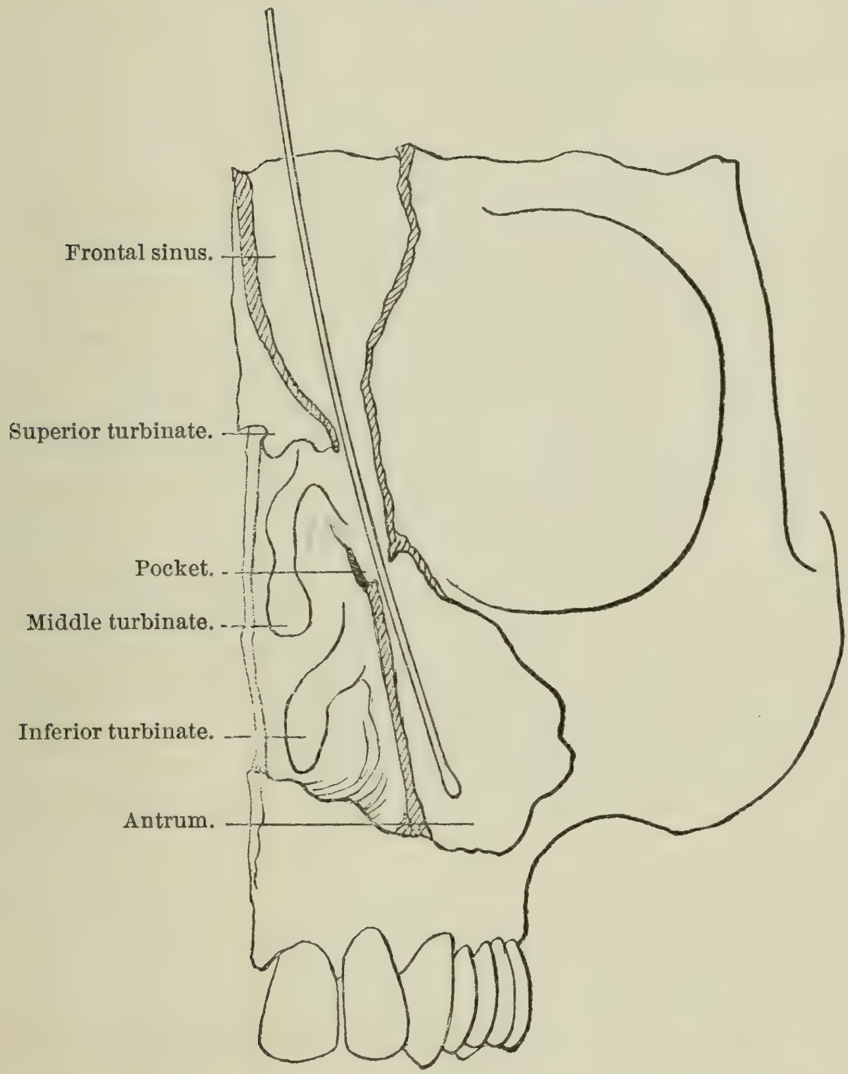
Fig. 1.



mucous membrane which serves as a continuation of the unciform process and reaches upward, covering the foramen and forming a pocket which effectually prevents any secretion from the frontal sinus getting into the meatus until the antrum and pocket are full to overflowing.

The pocket I have mentioned has been noticed by a few writers, but has been considered by them as an anomaly. If an anomaly, it is remarkable that I should have found it in seven out of eight specimens obtained at random, and the eighth specimen, in which it is absent, is plainly abnormal, as the foramen is very large and very irregular.

FIG. 2.



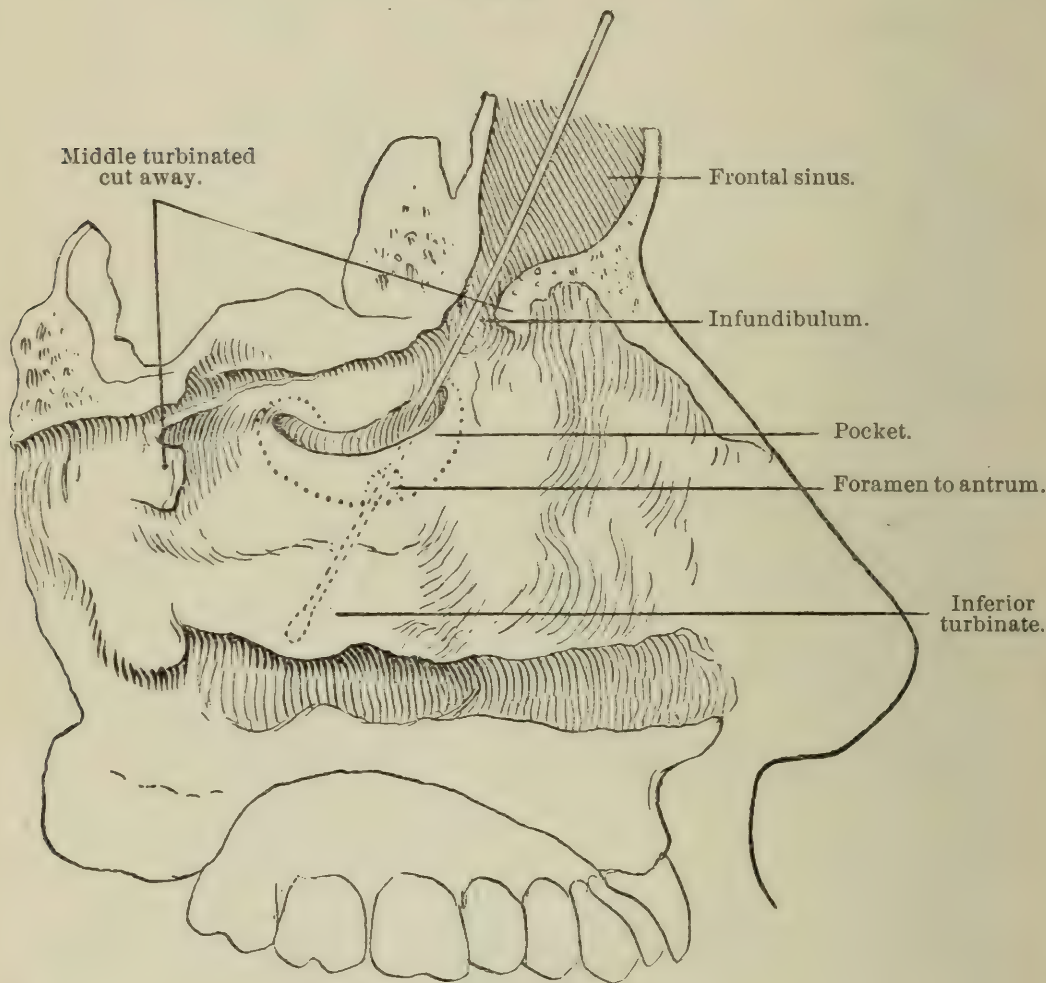
The continuation of the infundibulum is present in every specimen, and if the pocket is abnormal, my examinations show that it exists often enough to presume it present in every case where the frontal sinus is affected in conjunction with the antrum, and the discharge from the antrum will not cease.

As I remarked before, few have mentioned the physiological connection of the cavities.

Professor Dwight says, in answer to my request, "I have looked the matter up, and am convinced that the infundibulum opens most directly into the antrum, and that the common opening of the two into the middle meatus is practically on the inner side of the infundibulum."

Tillaux points out "that if fluid be injected into the frontal sinus, instead of running into the middle meatus, it passes in great

FIG. 3.



part into the antrum," and Merkle describes a fold of mucous membrane under the common opening, and accounts by this for the occurrence described by Tillaux.

Dr. W. H. Cryer mentions in his valuable paper read before this Association last year, that fluid may enter the antrum from the frontal sinus, but he makes no mention of the intimate connection which I have observed.

Professor Harrison Allen, in a paper published in the *Dental*

Cosmos, 1895, discusses the proliferation of empyema of the frontal sinus into the antrum, and of their coexistence in these cavities.

Dr. J. H. Bryan, in a paper published in the *Transactions of the American Laryngological Association*, 1895, mentions the fact of occasional communication between the two sinuses, but considers them anomalies.

Further than this I find no mention of this condition.

As the parts so overlay each other, it is impossible to show their relations by any series of photographs, hence I present drawings made by Mr. J. W. Emerton from the specimens in my possession, which verify their accuracy.

Fig. 1 is a lateral view of the face, and shows the general direction of the infundibulum, and the position of the antral foramen.

Fig. 2 is view of a transverse section cut through the middle of the foramen of the antrum.

Figs. 1 and 2 are necessarily somewhat diagrammatic.

Fig. 3 shows correctly the frontal sinus cut off at the level of the orbital ridge, and the continuation of the infundibulum to the foramen of the antrum in the middle meatus, indicated by the dotted circle at the bottom of the pocket. The curved dotted line indicates the line of the bottom of the pocket.

The bulb of the probe lies in the antrum, which is not opened. The middle turbinated bone is removed so as to fully expose to view the parts in question.

I trust the attention of anatomists may be given to this subject, and specimens enough may be examined to determine whether the above-described condition is an anomaly, or one of the normal arrangements, and in what proportion of cases it occurs.

Abstracts and Translations.

A METHOD OF STRENGTHENING VULCANITE PLATES.

BY C. R. MORLEY, L.D.S. (ENG.)

The following are the details of this demonstration:

Having obtained your plaster model in the usual way, take a zinc die with a lead reverse. Upon zinc strike a tin plate, No. 8 or No. 10, the size intended for the finished work, try this in the

mouth, and, having got a correct adaptation, take the bite, make articulation, and proceed to set up pin teeth in the ordinary way. Afterwards try temporary plate and teeth in the mouth and ascertain that the bite, position of the teeth, etc., are correct; then place plate upon the model and take plaster impressions of the fronts of the teeth. Take the temporary plate to pieces, and the relative positions of the teeth and model to each other will be given. The next step is to strike up a copper plate, No. 3, and upon this copper plate strike a perforated dental alloy plate, No. 6, and upon this a No. 8 or No. 10 tin plate, guided by the fronts and teeth; these plates must be made of such a size that they will just clear the pins of the teeth and lift out of the flask. Round the perforated dental alloy plate, under or a little within the pins of the teeth, a strip of strong plain dental alloy plate should be soldered at "*right angles*." The perforated dental alloy plate should extend from first molar to first molar, taking care to end the bar between the pins of either the first or second molars, and not opposite the division between teeth. At this stage the palatal portion of the plaster model is covered with a copper plate, and upon this a strengthened perforated dental alloy plate, and upon this again a tin plate; upon these plates wax up the teeth to the same extent, and in the same way as if attaching teeth by means of vulcanite to a gold plate. Then proceed to flask, and in ordinary cases use a two-part flask. "The packing is very important," and care must be exercised at every step. Begin by packing under and between the teeth in the usual way, then take a piece of extra thin rubber, cut it to the size of perforated dental alloy plate, place under the perforated plate, that is, upon the palatal side, and afterwards replace upon model in exact position, place tin plate upon this, heat up flask, and gradually close it. Now open the flask, remove the plate, and if the operation has been successfully conducted the perforated plate will be in the same position upon the model as before, only the copper plate is replaced with rubber; finish the packing and vulcanize in the usual way. In partial uppers the plan may be modified by substituting for the rectangular bar a piece of plain dental alloy plate, No. 8, about one-eighth or one-quarter inch wide, struck upon the labial edge of perforated dental alloy plate and soldered to it. In getting up and polishing plate care must be taken to avoid exposing perforated plate. Although this mode of working has been given as "a method of strengthening vulcanite plates," it could more correctly be described as "a method of making plates, using vulcanite as a means of gaining the fit to the mouth, and of attachment for

the teeth." Stress must be laid upon the leading feature, that practically the whole strength is the strengthened perforated dental alloy plate so arranged as to give the greatest degree of strength with the least substance.

Reports of Society Meetings.

AMERICAN DENTAL ASSOCIATION.

(Continued from page 806.)

August 5, 1896.—Second Day.—Evening Session.

Meeting called to order at 8.15 by the President, Dr. Crawford.

The minutes of the previous session were read and approved.

Dr. C. N. Peirce, on behalf of the Executive Committee, reported as follows:

The communication from the Publication Committee was read and duly considered, and upon unanimous recommendation, the transactions are again placed in the hands of the S. S. White Manufacturing Company for publication, with the distinct understanding that they shall be issued to the members of the Association at a date not later than February 1, 1897.

Regarding the one hundred dollars asked for by the Committee on National Museum and Library, it was, upon motion, recommended that a sum not exceeding this amount be appropriated, and the treasurer be authorized to pay on presentation of attested voucher for the same. The bill from the widow of J. J. R. Patrick was carefully considered. The committee recommend that in view of the fact that three hundred dollars had been paid Dr. Patrick, and also several sums from other sources for which no credit was given in the account, that the same be not paid, and that a communication be sent to Mrs. Patrick stating that the bill forwarded by her to the Association was referred to the Executive Committee with full power, and that the said committee having a full appreciation of the valuable services rendered by Dr. Patrick, not only to this Association, but to the profession at large, regret their inability to recognize the amount of the claim. They are influenced in this judgment by the fact that the duty to the trust

imposed upon them necessitate that they shall treat this matter in a truly business aspect only. The account has been settled in full, Dr. Patrick having drawn from the Association all moneys expended on their behalf and in their interest. The committee therefore consider that the claim cannot be recognized.

The bill from the S. S. White Manufacturing Company for $95.58 is to be paid on the endorsement of the Auditing Committee.

In view of the increased duties of the secretary, and his long and efficient service, it is recommended that the salary for the present incumbent for the coming year be three hundred dollars to enable him to procure such assistants as he may deem desirable.

The Executive Committee recommend that within twenty days after the transactions have been received by the members of the Association, the officers elected in the several sections shall notify the recording secretary of their acceptance of the position, and of the names of the members of their sections, and that sixty days thereafter the president or secretary of the section shall send to the recording secretary of the Association, as far as possible, the titles of papers and the prospective work they have to offer at the stated sessions of this Association.

Report adopted.

Dr. Grant Molyneaux, on behalf of the committee appointed to investigate the claims as to the priority of invention of an electric oven for fusing porcelain, reported that the first practical and public demonstration of an electric oven for fusing porcelain crowns and continuous-gum dentures occurred in October, 1894, Dr. L. E. Custer using an oven of his own invention and construction at the office of Dr. Haskell. Dr. Custer also used an oven of his invention in 1889. The committee believe that Dr. Custer was the first one to practically fuse porcelain in an electric oven, and recommend that this Association accord him that honor.

Dr. Crouse, of Chicago.—A year ago I gave the history of the litigation of the Dental Protective Association up to that date. At that time we had our testimony in and were waiting to have the case tried on the low bridge patent. As you know, the Crown Company had had a decision in their favor on the low bridge patent before, and we had been unable to get the case in any other court except the one in which they had obtained their decision. It was finally to be heard by Judge Wheeler, of Brattleboro', Vermont, in February. The case was four days on trial. We went into it with the greatest amount of doubt, from the fact of the decision having been rendered in favor of the patent before the

Superior Court of that Federal district. I am informed that there are only two or three cases on record where a judge occupying a lower position comes into the higher courts and reverses the decision of the higher courts, and ours happens to be one of the cases. When I left the court-room after Mr. Offield, our attorney, had made his argument I felt sure we would win our case, and the other side felt sure they would win. We arranged to have the clerk telegraph us as soon as a decision was rendered. Late in March we received a telegram stating that we had won our case. The next morning one of the attorneys for the Crown Company was in Mr. Offield's office to take testimony. They had not heard that the decision was rendered against them, and when he saw this telegram he left the office and went back to New York. This placed us on an even footing with the Crown Company in the next Federal court. Then their next effort was to get it on appeal, and the next month they brought us to New York on the plea that they had been deprived of their royalty for eight or nine years by this Dental Protective Association, and that the patent only had about two years to run before the time expired, and on that ground they wanted their case heard at once. We filed a counter affidavit to the effect that we had been trying to get them to try their case in some other court. I also filed another affidavit which may not seem important to you, but it is so, nevertheless. It was to the effect that I had knowledge sufficient to believe that there were parties back of this litigation outside of the Crown Company. In the answer the attorneys made no reference whatever to my affidavit, as they did not dare to deny it. The court overruled their motion to put the case on the calendar at once, and we went home, and after we were home about a week we got word again to come back. We sent a long telegram to the court stating it was impossible for us to get there on Tuesday when the case was to be heard, and that we could not come before Wednesday; and we also sent a telegram that, according to Judge Wallace's statement, we supposed that Judges Wallace and Shipman were unable to try this case. We went to New York, and the case was called Wednesday morning. We expected to try it, but we found that Judges Wallace and Shipman had decided not to sit in the case, but that Judges Lacrone and Townsend, of New Haven, would try it. We decided to go on with it. Mr. Dickerson, who had not appeared before, came in and said he represented other parties, and referred to the decision made before. The judge passed upon the points that had not been passed on before. He came down to the point that the

low bridge was not patentable, and that the cases of prior use that we had proved showed that the invention was not new. The case has been argued, and we have not received our decision yet. We expected to have it before this meeting, but we have no doubt about how it will be. We expect a favorable decision. Suppose we did not? It would not be wise for me to state what our course would be. Suppose we do get a favorable decision? That makes it impossible for the Crown Company to bring any further suits against members of the profession in the New England States; but if they wish to bring suits against other members of the profession in other parts of the country they can do so, and we will have to fight it further. The object of the Dental Protective Association is to band the profession together, so they can take care of themselves. Some three or four years ago the companies stated that they were tired of litigating, and were willing to take a sum of money and let us alone. The manufactured articles, under cover of patents, that the dental men were paying big prices for, were a greater abuse than the royalty demanded for using certain things; and, with a view of remedying that and banding the profession together, this Association was organized. I feel sure that the time will come when the members of the Association will see the importance of this movement and help along. If each member of the Association will take one share of stock, it is all I ask. The royalty that the companies will get from members of the Dental Protective Association is at an end. One office in New York, a firm of two, has paid the Crown Company over six thousand dollars in royalty since the Association was organized. They have paid that money according to their sworn statement as witnesses on the other side. The Dental Protective Association has recently been sued by the patentees and owners of the Donaldson canal-cleanser. We have prepared an instrument, and we are making it as good as any other, and furnishing it to the profession at one dollar and fifty cents per dozen. I would like to have another meeting of the members of the Dental Protective Association at another time, and we will try to arrange it for some time when it will not interfere with the regular sessions of the Association.

Dr. Brophy.—I wish to speak about the paper of Dr. Fillebrown. It is very interesting, and will excite a great deal of comment no doubt; it is one of great interest from an anatomical and pathological stand-point. I am convinced that cases of this nature occur far more frequently than we imagine. The question of the evacuation of fluids from the frontal sinus into the antrum has been little con-

sidered. Such conditions do exist. A fine probe may be carried into the antrum upward into the frontal sinus. This was accomplished after removing the greater portion of the upper part of the antrum. While Dr. Fillebrown did not state much about the treatment, I would say that the secret of success in empyema of the antrum is to keep it thoroughly clean, removing fluids, pus, and any foreign substance that may be present. In my experience I have found in a number of cases pieces of tooth-roots and other substances that have found their way into the opening made for the purpose of securing drainage. In a case I have in mind the surgeon, who treated the patient with flexible rubber tubing, lost a piece of the tubing, which passed into the antrum and remained there for several months, and was a constant source of irritation to the membrane. I removed it and had fairly good success with the case, which was a very difficult one to control.

The paper read by Dr. Barrett opens new thoughts in the field of prosthetic dentistry. A careful following of the rules laid down by him in adjusting dentures, although not done with a view of the anatomical relations, was most beautifully exhibited to us by Dr. Palmer. Those of you who will examine that plate will find that if it had been made of soft material, so the muscles could work into it, it would be exactly like Dr. Barrett told us about. Its firmness is, in a great measure, due to the relation of the muscles described by Dr. Barrett. I regard both papers of the very highest order, and we feel very glad, indeed, that our section has been able to present material of this kind to the profession.

Dr. Abbott.—I want to say a word in corroboration of the statement of the position taken by Dr. Fillebrown in this matter,—that there is an opening or a drainage from the frontal sinus into the antrum. I have for a long time believed this to be the case, but I have not had an opportunity of examining the antrum sufficiently to be sure of it. I remember one case where the surgeon who had it in charge took it away before I had a chance to thoroughly examine it, but we suspected that the trouble was in the frontal sinus. In cases of abscess of the antrum I believe that absolute cleanliness is what is needed, but it is the most difficult thing to do. There is where the trouble arises. I have devised a number of instruments for this purpose, and, as you know, I have the spray instrument, which I use. Where it is impossible to place the agent I wish, without using the pressure behind, I use the multiple spray, which throws it all around. I wind a mass of cotton on a bit of stick or wisp of broom, and use it for a plug. It has

worked better than anything else. I have treated several cases where the tubes have been in the mouth, and have removed the tubes and used plugs instead. Most of them get well, however, by leaving the antrum entirely alone. I know of a case where there was a large opening into which I could put my finger very easily. It had been treated by a gentleman from the country. I pulled out the pieces of cotton that were there, and gave the patient a prescription of one-sixty-fourth carbolic acid, and told him to wash it out himself, and it healed in a few months' time.

Dr. Holly-Smith.—The peculiar interest which attaches to my mind in regard to this suggestion of Dr. Fillebrown, relative to the anatomical arrangement, makes me recall some cases which I had with a throat and nose specialist in the temporary conditions following grippe, where examination has proved the cavity to be full of fluid, where no opening of any character has been made, and where recovery has resulted soon after the original trouble subsided. The statement made as to the leakage of the frontal sinus into the antrum was verified to me by a careful examination and experience with these cases. In reference to the treatment of these suppurating conditions in the antrum, I think that as a class we are too timid. I believe in a bolder operation. It is a well-known principle in surgery that we must have drainage for these conditions, and if men will heroically enter these cavities, cut out the floor, open up every part, curette the surface and pack with iodoform gauze,—instead of having a patient six months on your hands, those conditions will clear up in a short time. It is not necessary to make a marked deformity, which cannot be relieved; but I believe in an heroic operation for their relief. I have seen these cases treated for six years without relief, and an operation of the character which I have described has afforded relief in a few weeks.

Dr. Barrett.—We all recognize the importance of the subject, and I believe it to be an indisputable fact that dentists are about the poorest anatomists of those who practise the healing art; and yet no class of men should have a more intimate knowledge of anatomy, especially of the muscles of expression, than dentists. The horrible caricatures that we see in many mouths in which dentures are inserted, shows the lack of anatomical knowledge. I think dentists should study anatomy carefully, not only that they may restore the expression from the stand-point of nature, but that their prosthetic work may be a practical success.

In reference to Dr. Fillebrown's paper, I would say that last year Dr. Cryer presented a considerable number of anatomical

sections, which were to me a revelation. He showed in some of these, tracing the course of the canal through the infundibulum until it discharged directly into the antrum, that it could not discharge into the meatus of the nose, but into the antrum itself. That was comparatively new to me. I had suspected something of the kind, but thought that there was a breaking down which had allowed the discharge to enter the antrum. It leads so dangerously near to the opening into the antrum that it was plainly evident that in many cases it might directly discharge into it. Dr. Cryer proved it, and showed it upon the screen. He exhibited to some of us these preparations, and he demonstrated that one thing perfectly. From that time my practice has been in that direction to a large extent, and I have modified it in regard to antral troubles most materially. I have found this: I do not know what I may meet next week or next month, but during the past year I have found no necessity whatever for the insertion of any tube into the antrum. I believe it to be unpathological and unphilosophical. It is an irritant, and causes a breaking down of the tissue. If there be an eroded surface, or empyema, perfect drainage will be of great benefit. If there be granulations of the mucous membrane around it, I remove them in some way, but that there be any tube, I do not think necessary. I have had some remarkable cases. I am very glad to have a paper like this read. It is something that calls our attention to a condition that exists that we should know all about. If we will watch the conditions and become fully acquainted with the real study of the case, I think it will materially modify our practice in all of the antral diseases, and there is no necessity for the violent measures which we adopted in the past, especially the packing of the antrum with a foreign substance of any kind, or the introduction of a drainage-tube when it can be drained without.

Dr. Head.—I want to speak of the statement that has been made, that there is no class of practitioners that has so little knowledge of anatomy as dentists. I would state that there is one class that has even less knowledge, and that is the general practitioner of medicine.

Dr. Crouse requested the members of the Dental Protective Association to meet him to-morrow afternoon at three o'clock.

Dr. Ambler then read a short paper, of which an abstract follows.

This is a report of a case which I had in my practice,—a nodule on the apex of a root. A lady, aged about thirty, presented for

treatment a chronic abscess, the right superior lateral incisor. Upon examination with the probe, it was found that the labial wall of bone at the apex of the root had been destroyed. With the intention of scraping the apex and breaking up the sac, a small right-angle scoop was introduced and passed freely around and over the apex. Upon withdrawing it, a small nodule of dentine or enamel, about the size of an ordinary pin-head was brought away. The abscess was treated with pyrozone four times, at intervals of three days, when the discharge ceased. Evidently the pulp had been dead for a long time, and the canal had been filled, as there were large mesial and distal fillings. The case was lost sight of for a year, and in the mean time she had this lateral, also the right central, which was badly carious, extracted, and is now wearing an artificial denture. The special interest attached to this case is the fact of finding a nodule at the apex of the root and especially of a single-rooted tooth. Enamel nodules are small excrescences consisting of enamel occasionally met with upon the roots of the teeth. They are generally found upon multiple-rooted teeth, situated a little below the neck, and often at the junction of the roots. On dissection, they are found to consist of a cone of dentine covered with rather thick layers of enamel, and often connected to the crown by enamel. Wedl says that these nodules are the result of localized continuations of the development of the enamel between the already developed basal portion of the roots, and are produced by the strip of enamel organ which has persisted longer than the rest.

A cut of one of these nodules has been shown on the apex of a molar root, and the statement made that they may be accounted for by a budding of the tissues concerned in the process of formation of the tooth.

Tomes shows a cut of a nodule situated on the neck of a single-rooted superior cuspid. As far as I have been able to examine the dental literature upon this subject and this case, I find there has never been a case reported or a cut made like the one I have here noted. For that reason I thought it was worthy of being reported.

Dr. Morrison.—On inquiry of the different sections, I found there was nothing to be presented to this body upon the subject of the planting of teeth, and I do not like to have that go by default. It has been my good fortune to report to this body from year to year on such matters, and I merely want to report progress, and that I continue to plant teeth right along and do it with as much

confidence as ever, and with as much confidence in those teeth rendering good service for a reasonable time as any other dental operation that is performed. There are no new features that I wish to present at this time, but merely report progress. On the subject of another question that I think is a little new I have something to say. Instead of constructing an apparatus to regulate the whole arch or several teeth in the arch at one time, I merely direct the force upon one, using the hint of the physiological action that nature develops on one side at a time, sometimes one a little in advance of the other. I regulate in the same manner. I put my force against one side at a time. In interlocked laterals drive one side right forward where you want it in a week or ten days; then make a retaining band with a yoke on the two adjoining teeth and reverse the apparatus, and put it on the other side.

Dr. Fillebrown.—Within a few weeks I have had the privilege of speaking upon this subject before a dental society, and at their request, and partly at my suggestion, I wrote to Dr. Cryer, and he kindly loaned me all the slides that he exhibited before this Association last year. I took the text of his paper which he produced at the time, and I exhibited them and followed the text of the paper. All I have to say is that in that assortment of slides and in the text of his paper that I reproduced, he did not say anything in regard to the points which I have produced here, nor showed any slides at all like the ones I show you to-night. In regard to anatomy I just want to point the moral that Dr. Barrett has well remarked, that our dentists do not know enough about it, and that is a supreme reason why our dental schools should teach anatomy from the bottom to the top. At the Harvard School the dental students and the medical students are taught together, and also in some other schools. I speak of this school especially, because I know about it. During Dr. Holmes's incumbency of the chair of anatomy in the Harvard Dental School, there were only three or four men who reached a standard of one hundred in anatomy, and one of those is a dentist who is to-day practising. Our men are smart enough. Give them the opportunity, and they will come out accomplished in that respect.

Dr. Richards, of Knoxville, Tenn., presented a paper entitled "The Morphology of Dental Pulps," which was illustrated by lantern slides.

Adjournment.

(To be continued.)

ACADEMY OF STOMATOLOGY.

A REGULAR meeting of the Academy of Stomatology was held in the rooms of the society, November 24, 1896, Dr. James Truman presiding. The routine business being despatched, the report of the Clinic Committee was called for. Dr. H. C. Register, chairman of the committee, stated that the subjects of the clinic of the afternoon were the use of Fowler's solution as an obtundent, and the cleansing of the teeth with the aid of the tincture and compound tincture of iodine (liquor iodi compositus, Lugol's solution). This subject was to have been expounded and the method demonstrated by Dr. Francis, of New York, who forwarded a letter of regret at his inability to attend.

He states that he invariably uses iodine; it softens mucous accumulations, and acts as a tell-tale for disguised deposits of calculi. The preparation employed is the compound tincture of iodine. The method has been frequently described by Dr. Francis, and so he omits a detailed description of it in his letter.

Dr. Register described the method of using iodine, which is as follows: Applications of the dilute tincture are freely made to teeth and gums, which not only constringe puffy gums, drawing them away from about the teeth, but clearly outline any deposits which may be present. Deposits are defined by this means, which without it would entirely escape detection. The patient expresses gratification, not annoyance, at the sensation produced by the drug. The iodine appears to have the power of loosening the deposits upon the teeth. It insinuates itself into the minute recesses of rough areas of the crowns. The iodine is followed by applications of commercial ammonia, which is immediately decomposed, a colorless solution formed, and the teeth are found to be much lighter in color. The surfaces are subsequently cleansed and polished by means of buffs and fine pumice.

Dr. Jack.—What is your method of applying Fowler's solution as an obtunding agent?

Dr. Register.—The mouth is first sterilized by washing with a ten-per-cent. solution of electrozone, and the rubber dam applied. The cavity is dried with bibulous paper, and an application of carbolic acid is made, which is followed by blasts of warm air; then by a hot alcohol blast; a chamber containing cotton saturated with alcohol is heated, and a current of air charged with the heated vapor is directed into the cavity. A pledget of cotton is dipped

in the Fowler's solution and applied to the cavity walls, where it remains for about three to five minutes, when it is wiped away, and the hot blast applied for a minute or two.

Dr. Darby.—It appears to me that the measures you describe would be quite sufficient without the use of Fowler's solution. I should expect, after the adoption of such measures, that I could excavate almost any cavity without even discomfort to the patient.

Dr. Huey.—I would like to inquire how it is possible, where a great number of agents are combined or successively applied, to distinguish which of them has acted as the analgesic. I mean this not only in connection with the method described by Dr. Register, but with those preparations which contain a number of powerful coagulants and obtundents.

Dr. Register.—Several of the members have inquired into the use of the ribbon matrix, which I have been using for some time, and have demonstrated frequently. They are made of strips of thin, planished copper, thin enough to pass into small interspaces between the teeth, and be laced in and out these spaces. Cavities which are compound have by this means an additional wall made, against which the filling is impacted and its contour outlined. A great deal of time is saved by this means, not only in the impacting of the filling, but in the subsequent polishing operations.

Dr. Guilford.—I believe Dr. Herbst is the father of this form of matrix. He demonstrated its use several years ago when in this country. He used thin strips of steel or of German silver. One end of the strip was rolled into a cylinder, which anchored it between the teeth. The free end was then drawn into position and an additional wall given to the cavity.

Dr. Register.—I do not doubt this, but I did not see or hear of Dr. Herbst's matrix. Dr. Louis Jack is the father of the modern matrix, although Dr. William Trueman can furnish data which will show the matrix itself to be over one hundred years old.

Dr. Burchard.—Dr. Jack's matrix has a function distinct from all others, it outlines the desired contour; with previous matrixes and most others the contour is indefinite; with the Jack matrix the contour is predetermined and fixed, so that judicious burnishing of the filling proper condenses and shapes its cervical portion.

President Truman.—The paper of the evening, "Hypersensitivity of Dentine and its Treatment," by Dr. Burchard, is now in order.

Dr. Burchard.—I think I should preface the reading of this

essay by an apology to the members for its elementary character, and the evidences in it of hasty preparation. I am so busy with other matters that I have had only time to bring the subject matter of the essay together and have not looked at it since, to correct or modify.

The treatment of the subject, designedly deals alone with the general principles involved; details and minutiæ are deliberately omitted, in the hope that other essays upon the same subject may treat each phase of it exhaustively. It was nothing but a sense of duty which induced me to provide an essay for this meeting, as I can ill spare the time from other literary work, but as we were short an essay for November, and the council has not had time to secure one, I have assumed that duty as a part of my duties as a member of the council.

(For Dr. Burchard's paper, see page 1.)

DISCUSSION.

The President.—In my opinion, no essay ever called for less apology than this of Dr. Burchard, it is clear, practical, and exhaustive. The subject is now open for discussion, I shall call upon Dr. Cryer.

Dr. Cryer.—Personally I am highly pleased with the essay. It covers all of the principles involved in the subject, so that I shall confine my discussion to but one phase of the matters treated,—that is, the ill effects of cocaine injections about the jaws. The essayist alludes to the dangers involved in this operation, but my experience indicates that he might emphasize them still more, for I have noted serious surgical troubles, which if not caused by the injections, certainly followed close upon them. I shall select a few examples for illustration. The first case was that of an adult male, who received a cocaine injection prior to the extraction of a lower third molar.

Twenty-four hours after the operation a sensory paralysis began, which quickly involved all of the branches of the third or inferior maxillary division of the fifth nerve of the side. Within a few days more the paralysis was found to involve the second division of the nerve, and shortly after the first division. Following upon this, evidences of involvement of the seventh nerve became marked, motor paralysis of the muscles of the face being noted. It was at this time that I was called to see the case and elicited the above history, and noted that a peculiar necrotic condition of the inferior maxilla existed; there was no evidence of sequestra being

formed, the bone appearing to have undergone a molecular death which did not resemble ordinary caries, nor was there any evidence of osteomyelitis. The dead bone was burred away, and the case recovered, but the nerve lesion extended until the cerebrum was involved.

In another case, where a cocaine injection had been made over a molar, evidences of inflammatory disturbance in the second division of the fifth nerve became marked, and three months after, a necrosis similar to that described before was found.

I have seen nine other cases in which there were similar disturbances noted. To sum up, my experience is strongly against the use of cocaine injections, and when I wrote the chapter on extraction for the new text-book on operative dentistry, I refused to consider the subject of the hypodermic use of cocaine about the jaws except to condemn it; so that Dr. Burchard was assigned the work, and it is my opinion that he is also opposed to the practice.

Dr. Burchard.—These cases of Dr. Cryer indicate an ascending neuritis, and possibly are an evidence of the trophic influence of the nervous supply to a part. Were there any inflammatory disturbances preceding or attendant upon the progress of the necrosis, such as periostitis?

Dr. Cryer.—None that I noted.

Dr. S. Freeman, of New York.—The essayist has alluded to the several methods in which electricity is used as an obtundent. In a conversation with Dr. Flagg he stated that he had had enough of electricity. The apparatus of Flagg produces an interrupted current which differs in its effects from galvanism, as noted in the essay. I have used the cataphoric current and in a manner which lessens the time of inducing analgesia. The tooth is placed under dam, is dried, and a saline solution of cocaine is applied, which remains a short time; then the cataphoric current is applied, and is effective in about eight minutes.

Dr. Inglis.—The dental helix does not produce an induced current and is not analgesic. The positive electrode is placed on the gum over the tooth, the negative electrode is held in the hand; instead of producing analgesia it produces a diverting sensation which lessens the patient's perception of the pain of excavation.

The essayist has not alluded to the use of eucaine, which in two-per-cent. solution is more effective than cocaine, and produces local hyperæmia instead of local anæmia.

Dr. William H. Trueman.—Before discussing the essay I should prefer to read and reread it when it is printed, as I did not catch

all of its bearings. As a matter of fact, I seldom use an obtundent, except properly-formed tools, and applying them with a view to the work they are to do and how they can do it. This is an important matter, and one to which too little attention is directed. Those of you who are familiar with lathe work know how much the cutting of a tool depends upon the precise shape of the edge of the tool, the way it is clamped in the slide-nest, and the way it is presented to the metal it is to cut. Correctly applied in all three of these particulars, a tool cuts smoothly; improperly formed or applied, it chatters, and instead of cutting smoothly it jars and cuts roughly. Again, the tool edge should be shaped with a recognition of the material it is to cut, and a tool made to cut or dress enamel has an entirely different edge and cutting angle from one designed to cut dentine. In cutting this tissue the tool edge should be shaped so that it will cut like the chisel of a carpenter's plane; shave off a smooth cut of dentine, not chatter or jar out pieces of it. A tool which cuts best is rigidly held to its work by an inflexible stem, and will produce the least pain, in most cases producing little or none.

I have used oil of mustard as an obtundent, and have found it to do its work well. It is very pungent and comparatively inexpensive. I do not know whether the essayist mentioned this agent.

Dr. Burchard.—No; nor did I mention the fact that it is a powerful germicide.

Dr. Register.—I have been using Fowler's solution as an obtundent for more than four years, and have noted no ill effects in connection with its use. I recognize, of course, that it would not do to teach students to use any of the arsenical preparations as obtundents, but as I am talking to experienced practitioners, I present the subject for your consideration. I do not believe a pulp can be killed by its use. I have tried it and failed; moreover, I have never had a case of pulpitis following its use. Of course, an antidote should be applied after using it. I have used Fowler's solution in double strength (two per cent.) and filled the cavity with cement, and after weeks, upon removing the filling have found the dentine sensitive. Our essayist before he became a professor was much taken up with this matter when I discussed it with him.

Dr. Burchard.—Cautiously curious is the phrase, not "taken up with it."

Dr. Register.—Yes, you were suspicious.

Dr. Jack.—It appears to me, Dr. Register, that your method

consumes quite as much time as that required for inducing cocaine anæsthesia by means of electrical osmosis.

Dr. Register.—Yes, I think it does. I would like to test the comparative effectiveness of the two methods in point of time. It is to be understood, of course, that I advise extreme caution in the use of Fowler's solution.

Dr. Guilford.—The paper is very exhaustive, covering all of the principles involved in the subject. My observations in this connection extend over a long period of years,—about thirty. Beginning then with keen edge instruments as obtundents, we come at this day to electrical osmosis, and what have we not had between? The demands for dentinal analgesia are, I believe, more imperative to-day than ever before. In my opinion, the most important element in inducing or producing this analgesia is desiccation. It is very rare that you will find a tooth which has had its dentine dried until it shows almost chalky white that will exhibit any sensitiveness. And, again, drying in connection with other obtundents renders these latter more effective. The milder obtundents are, as a rule, not positive enough in their effects. I have used sulphuric acid as an obtundent, and am glad the essayist has called pronounced attention to this agent, for it is of great importance. I use it in combination with glycerin, making a body corresponding with the proprietary agent known as Thayer's No. 4.

Dr. Freeman.—That preparation contains trichloracetic acid.

Dr. Guilford.—When the editor of the *Dental Cosmos*, Dr. Kirk, made analyses of a great number of proprietary agents, he stated that sulphuric acid was the acid in this preparation. I find this combination of glycerin and sulphuric acid to be excellent and prompt in its effects. Certainly cataphoresis is the best of all our means, as it does the work without producing chemical destruction, and does it thoroughly; the time required is the only objection. I think Dr. Van Woert, of Brooklyn, first called attention to sulphuric acid as an obtundent. The effect of sulphuric acid is self-limited.

Dr. Jack.—What is the technique?

Dr. Guilford.—The rubber dam is applied, the cavity dried, and the softer caries removed; then dry again, and dip a pin-head piece of cotton in the acid and lay it upon the dentine, and touch the dentinal walls, in five minutes the excavation may be made. As a rule, one application is sufficient.

Dr. Freeman.—Some years ago Dr. Herbst used a saturated solution of cocaine in sulphuric acid as an obtundent. I have heard operators who have used sulphuric acid as an obtundent complain

of the caving in of fillings placed in the cavities, and again, in using sulphuric acid in the roots of teeth, we may erode the roots and make large openings through them at the apex. I have used Thayer's preparation in root-canals, this preparation containing trichloracetic, not sulphuric, acid.

A. H. Porter.—The essayist, ably representing current thought, expressly implied its inability to express an accurate explanation of exaltation and nutrition. Electro-physiology and electro-chemistry, measuring vital action with mathematical precision, attack every inch of the ground, and determine at what point a stimulus increases instead of diminishes pain.

The specific elements of a cell combine to give it a specific tension, enabling it to respond to specific pressure (vibrations of air, chemical agents, ethereal oscillations, etc.). In physical language this response is effected by the release of the tension, chemically it is a dissociation. But this is not the only effect of the primary stimulus from the environment. Dependent on the dissociation of the exalted cell, an inverse association from blood plasma or adjacent tissue takes place. If the primary stimulus ceases at the moment of complete dissociation (a critical point to the organism), and the new cells are in excess of the disintegration, the effect has been constructive or anabolic. At this juncture the dissociated energies, recognized as carbonic acid gas, urates, etc., expel themselves.

When, however, by the continuance of the primary stimulus they cannot accomplish this, their force is exerted against the surrounding cells, causing the intense pain, overwhelming sense of pressure, failure of circulatory and respiratory activities characteristic of the prolonged use of anæsthetics and poisons. The hallucinations described by subjects are due to the dissociation of a cell by another instead of by an excitation from the outer world.

This antagonistic pressure is well illustrated in the many and varied forms of disease,—cancers, tumors, microbes and their products, concretions, gaseous accumulations, and morbid growths more or less organized.

Dr. Wm. H. Trueman.—Many years ago Dr. J. D. White introduced the practice of making applications of dry arsenic to cavities, letting it remain a short time, blowing it away, and then excavating. For my own part I am extremely afraid of arsenic. I recall now one case in which I used arsenic as an obtundent, and although the pulp remained alive for some years, I had occasion to open the tooth after several years had elapsed and found the pulp

dead. It takes a very minute portion of arsenic to kill a pulp. Dr. Flagg says he took one-twelfth grain of arsenic and used it as an application in devitalizing several pulps, and at the end recovered his one-twelfth grain, none of it having been absorbed by the several pulps.

Dr. Register.—In years back, I experimented with arsenic as an obtunder and found it failed me. Some twenty years ago I used aromatic sulphuric acid as an obtundent and found it effective. At that time, Dr. Litch suggested to me to use the pure acid: it could do no damage. I tried it, and use it to this day.

Dr. Burchard.—Have you noted sinking fillings, softened dentine perforated roots following its use?

Dr. Register.—No; no damage whatever has been noted.

Dr. Darby.—There is an admirable and most effective agent or preparation which has not been mentioned this evening. It is a mixture of potassium hydrate and carbolic acid in equal parts; commercially the preparation is known as Robinson's remedy. A short period of pain follows its application, much less, however, than when zinc chloride is used. In a few minutes the dentine is insensitive and excavation may be accomplished. Zinc chloride, a very positive obtunder, may produce extreme suffering. I have used sulphuric acid full strength as an obtunder when the fifty-per-cent. solution has failed to obtund.

I find it particularly useful in those labial cavities which are so often exquisitely sensitive. The application sometimes causes pain, but it certainly obtunds, and very promptly too.

Dr. Huey.—Perhaps the most annoying and obstinate cases of dentinal hypersensitivity which call for relief are those areas upon the necks of teeth left bare by the recession of the gum, without any evidences of caries being present. The cementum is abraded until worn off, and the exposed dentine is extremely sensitive. Many years ago Dr. Guilford suggested to me the use of a mixture of equal parts of sodium hydrate and carbolic acid. This is very similar to Robinson's remedy, which contains the potassium hydrate. Mixed in equal parts, a gelatinous mass forms, which may be diluted with alcohol. The combination of the sodium and carbolic acid is active, attended by the evolution of much heat. I find this agent for the class of cases named invariably successful.

The painful stage is very short and the anlagesia is complete. To prevent the contact of the obtundent with the gum, I utilize a little wrinkle shown by Dr. Bratt at a meeting of the Pennsylvania State Dental Society two years ago. He uses this to prevent the

access of moisture to cervical cavities while filling them with soft foil. A number of very small pieces of bibulous paper are rolled together until they have the size and form of a grain of oats. One end of the roll is tucked under the gum margin between the teeth, and the rest gradually worked under the margin until the other end is beneath the gum in the opposite proximal space. This effectually prevents the contact of the powerful mixture with the gum, if ordinary care be used. For general obtunding I depend upon thorough desiccation.

Dr. Inglis.—For some years I practised in Rio Janeiro, and had exceptional opportunities for noting the ill effects of arsenic indiscriminately applied. The Brazilian dentists appear to apply arsenic in superficial cavities as an obtundent, and, as a consequence, dead pulps are very, very common. I can testify to the efficacy of the potassium hydrate and carbolic acid prescription.

I have used lactic acid in the cases for which sulphuric acid has been recommended. It does not corrode the broaches.

Dr. James Truman.—Personally I am opposed to the indiscriminate use of powerful acids and escharotics. It must be remembered that in dealing with dentine we are dealing with a vital tissue. As the essayist pointed out, the basis substance of the dentine is penetrated by protoplasmic filaments which are in direct union with the boundary cells of the pulp, and when these protoplasmic filaments are irritated, how can we limit the extent or depth of the irritation? Such agents as sodium and potassium hydrate are very penetrating in effect. The anatomy and physiology of the tissue operated upon must be considered, and we can then see that we cannot limit and define the extent of ultimate irritation which may be induced. A quarter of a century ago I was convinced that the hypersensitivity found in the dentine of carious teeth was due to an acid condition in the parts, and at that time recommended that applications of sodium bicarbonate be used to neutralize the acid, and thus remove the source of irritation; the results of practice bear out the primary opinion, for the alkaline salt certainly acts as an obtundent, without disturbing the vital portions of the dentine.

The President.—Dr. Burchard, will you close the discussion?

Dr. Burchard.—I have made no notes for discussion, but there are a few points which call for some comment. As to the omission of eucaine from my paper, it was deliberate, as was also not mentioning tropacocaine, an agent which also produces local hyperæmia, instead of the anæmia as cocaine. The latter was named as

the representative of a class. Dr. Porter takes me to task for recognizing the chemical factor as the ultimate one in this connection, and certainly it is, so far as actual inductive science permits us to go. I recognize, of course, the importance of speculative reasoning, but, so far as technical matters are concerned, I prefer to set aside the profound interest which I have always felt in speculative philosophy and the formulating of hypotheses as to scientific matters, and deal directly with those things which are actually demonstrable. I did not touch at all upon speculative matters in the essay, omitting even mention of the theories as to the nature of anæsthesia, and among these latter the partially demonstrable premise of the semi-coagulation theory of anæsthesia, with which no doubt we are all familiar. I did not even classify certain remedies in the group producing the condition named by Liebreich, "anæstheica dolorosa." The essay is purely clinical and not in the least speculative. I think, however, that if Dr. Porter will carry his speculation in a direct line he will come to see that the entire science of pharmacology is inseparable from chemistry, which applies also to even the science of biology. This much for speculative reasoning. In regard to the use of arsenic as an obtunding agent, my opinion, based upon all sound clinical evidences is that it should be absolutely condemned and excluded. Its effects are necrotic and deeply so. It should never be used unless the death of the pulp is deliberately desired. I view even Fowler's solution with suspicion, and certainly should not use it until clinical records are much more extensive.

I am at a loss to understand how the effects named by Dr. Freeman as following applications of sulphuric acid could be brought about unless the tooth were actually drenched with the acid. The effect of sulphuric acid is chemically self-limited, and it would require a great deal of acid or a great deal of carelessness to bring about the conditions he describes. I have used it quite freely in root-canals, and have even carried it through the apex of the root, and have had no trouble; far from having its effect wide-spread, it is difficult and tedious to get the acid to accomplish the limited dentine destruction desired.

I had hoped in the essay to call more definite and pronounced attention to the studies of Dr. Truman as to the relative coagulating power of chemical agents; the subject has an important clinical bearing.

Henry H. Burchard,
Editor Academy of Stomatology.

THE NEW YORK INSTITUTE OF STOMATOLOGY.

A REGULAR meeting of the Institute was held on Tuesday evening, October 6, 1896, at the house of Dr. C. A. Woodward, 49 West Forty-sixth Street, the President, Dr. Benjamin Lord, in the chair.

The President.—This being the first meeting after our summer vacation, it is naturally an occasion for congratulations and greetings, but we have also feelings of sorrow and sadness, owing to the fact that death has visited us and taken from among us our secretary, Dr. C. F. Ives.

We can only think of him as a warm-hearted friend, an interesting associate, and a faithful and efficient officer, one who was greatly interested in the work of the Institute, and we shall greatly miss both his companionship and his valuable services.

It will be most fitting and proper that a committee be chosen to prepare and present, at a proper time, a suitable memorial in behalf of the deceased, to be entered upon our minutes and to go into our proceedings. What is the pleasure of the meeting in regard to it?

Dr. George S. Allan.—Mr. President, we are, of course, of one mind and one thought upon this matter. Dr. Ives was a man deeply interested in our work, and we shall miss him the more as we come to know how much he was worth to us; especially those of us who knew how patiently he bore up under his physical suffering and who knew the pathetic story of his agony at times. He breathed no word of fault-finding or railing against the burdens that became at last too heavy. Whoever met him, whether in the office, in the street, or in society, always found him the same pleasant, genial associate. It will not do to take up our time this evening to pass upon his merits in words of eulogy, but your suggestion, Mr. President, is a proper and fitting one; and I would move that a committee be appointed to put in proper shape our thoughts and feelings, and to report at an early meeting.

Dr. Allan's motion was carried, and the President appointed, as such committee, Dr. Howe and Dr. Davenport.

The President requested Dr. Wilson to act as secretary for the evening.

The minutes of the last meeting were read and approved.

The President.—Dr. Davenport, has a communication to offer and we will be glad to hear from him now.

Dr. S. E. Davenport.—Intelligence of the death of Dr. E. A. Stebbins, of Shelburne Falls, Massachusetts, having recently been received, I beg the privilege of paying a short tribute to his sterling qualities and fine professional attainments.

A successful practitioner and an exceptionally fine operator, his fame was established throughout the profession because of original work done in two important directions,—carefully tabulated results of experiments concerning the relative value, strength, and durability of different materials and methods used in prosthetic dentistry, and the establishment of the use of nitrate of silver in daily practice on a scientific basis.

Nitrate of silver has, of course, long been used for cauterizing sensitive and eroded surfaces, but to Dr. Stebbins more than any other man does the profession owe its present knowledge of the great value of the nitrate of silver as an agent for the prevention and limitation of caries.

He made extensive experiments with it for a period of several years, and when his experience proved that it was of great value, particularly in the treatment of caries in children's teeth, he at once gave the profession the benefit of his deductions, at a considerable sacrifice, too, of time and money spent in attending distant society meetings for that purpose.

There is every possible incentive for dentists residing in large cities to engage in some form of original work, but when a man's lot is cast in a small town, as Dr. Stebbins's was, and he rises superior to the discouraging and non-appreciative influences surrounding him, and forces world-wide recognition from scientific men, the credit due him is certainly very great.

Dr. Stebbins was prominent in the different dental societies of his vicinity, and for a time president of the old Connecticut Valley Dental Society.

His death makes a vacancy in the ranks of the profession which cannot be filled.

The President.—Now for a few moments we will ask attention to the work of the committees. Dr. Bogue, the chairman of the Committee on Operative Dentistry, being absent, we will be glad to hear from any member of the committee.

Dr. George A. Wilson.—Being one of the committee on operative dentistry, whose report is now called for, and in the absence of its chairman, let me say, pursuant to the subject of the evening, —that of reducing the pain of our operations,—instead of a cataphoric instrument, which I have not tried, I have been using, for

the past five years or more, chloroform applied on a pellet of cotton in the cavity, after placing on the rubber dam. It takes little time, acts rapidly, and very satisfactory results follow.

The President.—Will Dr. Wilson tell us how long a time is required to get the result?

Dr. Wilson.—From five to fifteen minutes may be required to reduce extreme sensitiveness. It hurts a little at first, but if the chloroform is applied *warm*, the sensitiveness soon subsides. If there are two cavities open at the same time, the application can be made to one while the other is operated upon. In this way absolute *dryness of the cavity* is secured,—the secret, perhaps, of pain reduction,—while the suggestion conveyed to the mind by slight inhalation also has, upon most patients, a seductive and soothing effect. It is a simple thing, and has proved very efficient, more so than any other remedy that I have tried.

The President.—We will now have the pleasure of listening to Dr. Wendell C. Phillips. He has no need of an introduction, for he has been with us before.

Dr. Wendell C. Phillips.—Mr. President and Gentlemen, I hope you will bear with me if I call your attention to what appears to have been an error in the report which your Committee on Current Literature published in the July number of the INTERNATIONAL DENTAL JOURNAL. It so happened that in that issue an article appears from my own pen, in which I make certain statements which are contradicted by your committee on current literature. I know you will do me the honor to give me an opportunity to defend the position which I take, and at the same time I know that, so far as your society is concerned, you are after the truth in all matters pertaining to cataphoresis. Now, in the article to which I refer I make the following statement: "A rheostat is an adjustable resistance introduced into the circuit in simple connection with the patient to control the quantity of current flowing, without regard to steady voltage. An adapter is an elaborated rheostat for use with the various street currents. A cell-selector is a series of contact points, over which travels a sliding switch-arm, each point connecting with one or more cells of a series battery. These cells ordinarily represent about two volts of pressure each." "The fractional volt-selector will give gradations of less than one-quarter of a volt," etc.

Now, gentlemen, I want to say that by actual test the fractional volt-selector will give not only gradations of less than one-quarter of a volt, but less than one-tenth of a volt. The report of your

committee, to which I refer, says as follows: "Drs. Morton and Gillett bring forward the Wheeler volt-selector, an apparatus for turning on the current slowly; it is misnamed a volt-selector, and is merely a suitable rheostat."

Now, either your committee is at fault or Professor Morton, Dr. Gillett, and myself are at fault in that statement. Feeling sure that you would like to know which one is correct, I asked Mr. Wheeler to-night to bring the apparatus necessary to prove by ocular demonstration that the ground taken by Professor Morton, Dr. Gillett, and myself is the correct one. I might further say that it was Professor Morton's suggestion that gave the name of fractional volt-selector to this instrument. I do not know of any one who has had anything to do with electro-therapeutics who is more justly entitled to give a name to such an instrument than Professor Morton. The instrument referred to is not a rheostat, because it controls voltage in fractions.

The subject of the evening, "A Table of Differential Resistances of Fluids for Cataphoric Study," was then taken up, and an interesting discussion ensued, being participated in by Drs. Wendell C. Phillips, George S. Allan, J. Morgan Howe, Harry Waite, Mr. George M. Wheeler, and the President.

As the subject is to be continued at a future meeting a full report will be published at that time.

Adjourned.

S. E. Davenport, D.D., M.D.S.,
Editor The New York Institute of Stomatology.

CENTRAL DENTAL ASSOCIATION OF NORTHERN NEW JERSEY.

A regular meeting of the Association was held on Monday evening, September 21, 1896, at the parlors of Mr. S. Davis, 943 Broad Street, Newark, N. J., the President, Dr. Walter Woolsey, in the chair, the usual Association dinner preceding the meeting.

The President.—The next thing in order is the discussion of the evening. On account of the absence of the essayist, the following subjects will be brought up for discussion: What amalgam do you individually consider the best? To what extent is the washing of amalgam an important feature in the production of a good filling? Dr. Hané, of Jersey City, will open the discussion.

Dr. Hané.—Mr. President, I don't know much about amalgam in this way; I think the discussion ought to have been on the question, What amalgam do you think best at the present time? We have amalgams of different kinds.

There are some amalgams that I used heretofore, or am using now, that may be considered good. When I commenced with amalgam I used the standard alloy, paying six dollars an ounce for it. I have since that time used the alba alloy, made by the S. S. White Dental Manufacturing Company, and I have also employed an alloy that is made by Olof Johanson in New York, at a cost of one dollar and fifty cents an ounce; and I find that we can make good fillings with any of these amalgams if we take care to prepare them properly, and have the material thoroughly dry, and not rub it into the cavity, but drive it home by tapping, somewhat as you would gold. The exception to this is when the first pieces are placed in the cavity they may be rubbed into the undercuts. One of the principal requirements for the success of amalgam, in my experience, is that the fillings must be properly polished; and you cannot finish the fillings at the time of inserting them; you must have your patient come back in two or three days or weeks, or months afterwards, and then complete the work. In this way you will find that almost any of these amalgams will wear a long time. There will be a little shrinkage, but without rolling up,—I do not know what other expression to use. I think that the proper finishing up of fillings is one of the principal elements of success.

I do not know that washing of amalgam has much to do with its wearing qualities. When I was in the habit of washing amalgam I used rectified spirits of wine or pure alcohol, then thoroughly drying in a towel before squeezing out the surplus mercury. That simply removes any dirt that may have been deposited on the amalgam in the office, and the oxidation caused by access of air into the bottle or wherever it may be kept.

Dr. Barlow.—Mr. President, I have used several different amalgams in my practice; I have used Welch's alloy, which is very satisfactory to me, and also Park & Carhart's amalgam, which I consider very good. In working my amalgam I am very particular to use a good quantity of mercury, working up the alloy so as to get it of a velvety texture and have the metals well amalgamated. I then press out all the mercury possible to remove, so that when it is used it will powder up; then insert it in that condition, and pack well into the cavity and the under-cuts. Bibulous paper is

then used after the style that was once explained by Dr. Bonwill a number of years ago at Asbury Park. I have been practising that method of packing amalgam since that time. After the filling is inserted I trim and burnish it well, finishing the filling at once, and placing a polish on it that will remain. I am using an amalgam now that Dr. Meeker, I think, mentioned; it comes from Philadelphia; a sample was left with me, but I did not think much of it at that time; but I fell short of amalgam one day, and I used that, and was very well pleased with it. It works very nicely, gives good sharp edges, and has very little shrinkage, and it can be finished up if manipulated right. Everything is in the manipulation. I never place amalgam into a cavity in a plastic state and then work it up. It is almost in a solid condition, and inserted with spatulas and burnishers, using bibulous paper.

The President.—I have washed amalgam, but not recently. I do not think there is any great advantage in it, unless you have had it in the office for a long time. If you get it fresh and use it within a reasonable time there is no great gain in washing.

Dr. Watkins.—Mr. President, I do not agree with a good many dentists as to the manner of using amalgam. In inserting an amalgam filling we should take the same care as we would in placing in a gold filling. I believe there is more in the working of an amalgam and finishing than there is really in the amalgam itself, although there is a very great difference in amalgams. Now, unlike Dr. Barlow and many others, including Dr. Kirk, I use as little mercury as I can and have the amalgam hold together. Dr. Kirk gave us a long paper before the First District Dental Society of New York, in which he told us that we should always mix our amalgam with plenty of mercury, and then press out the mercury; that the mercury when thus pressed carried with it a certain portion of the metal,—what it was he did not tell us,—the getting rid of which improved the material, and left it in better condition, just why, he could not explain, in the same way that Dr. Barlow cannot tell us what combination he has when he has pressed out the mercury. Now, I do not use pressure. I mix the amalgam as dry as I can mix it, and have it hold together. I believe that amalgam should be mixed so as to have as much of the metal and as little of the mercury as possible, and then work it in with bibulous paper compresses so as to make it perfectly solid in the cavity, driving the mercury out while inserting the filling rather than in the preparation for the filling. And I would fill the cavity much more than full, wiping the mercury away as it rises to the top or sides,

so that after the filling is completed the cavity is considerably fuller than is necessary; then cutting the surface down so as to secure proper shape and contour. The filling material in the cavity is perfectly hard, dense, and firm, and the instruments will give it a fine polish. Fillings placed in that way will change color very little, less, I think, than if placed in by any other method. They have strong edges, there will be very little bulging, they polish nicely, and there will be very little change of color, provided you use the rubber-dam while packing the amalgam. I would not use a matrix. I do not believe in them. Many dentists use them, and many will say that I am behind the times in objecting to them. I have used the matrix, but I saw no benefit in it, and abandoned it years ago. Where there are two approximate fillings to be made, and the space is quite large, I believe that this should be completely filled; I mean a space of say the thickness of a twenty-five- or fifty-cent piece, solidly with amalgam, and then separate the fillings by running a ribbon-saw between them. In that way you have all parts of the fillings of exactly the same density, and that is a secret of success in inserting amalgam fillings. The filling, after trimming with instruments, may be finished and polished with a fine tape. A beautiful contour is secured, and the edges are perfectly solid, close, and dense.

In regard to different kinds of amalgam: A few years ago I experimented with a number of different kinds. I had in the lot four or five different amalgams, including several White amalgams known as such, and other three-dollar amalgams. I made the experiments in this way: I would take two or three molars with large cavities, perhaps on the grinding, approximate, and buccal surfaces, place the dam on all of those teeth at the same time, and then fill one cavity with one kind of amalgam, another cavity with another kind, and another cavity with another kind; perhaps the buccal surface of a wisdom-tooth with one kind, the grinding surface of the same tooth with another; then a buccal cavity in the second molar with the same material placed in the grinding surface of the third molar; and on the grinding surface of the second molar the same material as in the buccal surface of the third molar, in that way mixing them up, and manipulating all with the same care, trimming the edges fairly around so that there would be no crumbling of the edges, and no weak points, and keeping the cavities perfectly dry while filling. I then marked those fillings and watched them from time to time; and in every instance, when I came to look at those fillings, I found Lawrence's amalgam stand-

ing pre-eminent so far as edge-strength was concerned. In color there was very little difference, so little that no one but myself, unless familiar with the different filling-materials used in the same teeth in different cavities, could discover any variation in color. Lawrence's amalgam had a little more of the steel color than the others, but the difference was slight, and it did not turn brown or dark, as it has the reputation of doing. In my hands Lawrence's amalgam has proved to be the best amalgam that I have used.

Dr. Adelberg.—Mr. President, may I ask Dr. Watkins whether he gave the other amalgams the same chance that he gave Lawrence's? Did you place Lawrence's amalgam in the buccal surface of the wisdom-tooth and the other amalgams in the grinding surface of the wisdom-tooth, and *vice versa?*

Dr. Watkins.—I mixed them up in every way.

Dr. Richards.—Mr. President, Dr. Watkins spoke of the mercury coming to the surface. There is a way to get rid of that, and it may be worth knowing, although I do not pretend that it was original with me. I do not wash my amalgam, although I formerly did. I make use of fine cloth for expressing the mercury. I make little tablets, cut into small pieces, and pack them all around, hard, on top. For the purpose of removing the excess of mercury I take small pieces of silver, the size of a very large pin-head, pick them up with pliers and hold them on the surface for a short time, one after another, and in that way take up all the excess of mercury. I then leave the filling a few days, finishing it up later when the patient returns for that purpose. In this way you secure a very satisfactory filling.

Dr. Adams.—Mr. President, this subject of amalgam is one of great importance. There are many men in our profession who profess never to have used amalgam, but I am incredulous. It is impossible to believe there is a dentist who considers the welfare of his patients who does not use amalgam to a greater or less extent. I have used several different amalgams, and my experience has been that the amalgam that serves the purpose with the best results, whether it be Welch's golden platinum alloy or any other amalgam that will not discolor and disfigure the tooth, but preserve it in its integrity, is the amalgam to use. Several years since, I abandoned washing amalgam because I did not see that any special good resulted. I take pains to express all the mercury possible, through a piece of chamois with a pair of pliers, and then pack the amalgam as solidly as it is possible to do. I do not think it is necessary to use the

mallet. A pretty good filling can be made in this way, and one that, in my experience, will last for a long while. There is one question I would like to ask Dr. Watkins. Possibly I misunderstood him in his remarks, but I believe he stated that he never uses a matrix. I understood him, furthermore, to say that, if there were two approximate cavities—say, a posterior and an anterior approximate cavity—in two contiguous teeth, with a space between them the thickness of a silver dollar, that that space should be filled in filling the cavities. Am I right, Dr. Watkins?

Dr. Watkins.—I will acknowledge that, although I said a twenty-five-cent piece.

Dr. Adams.—And when that space is filled, he then with a ribbon-saw divides those two fillings; and the question I now want to ask is how he provides for the removal of the excess of amalgam that will necessarily be around the necks of those teeth? I want to know how he is sure that he has removed all the excess of amalgam and that a perfectly free surface is left there? It seems to me that the amalgam reaching over the necks of the teeth beyond the cavities will make a beautiful place for the accumulation of trouble.

Dr. Watkins.—I will answer that question by stating that I use Dr. Watkins's amalgam-trimming instruments for that purpose, and they do the work beautifully. After I use the ribbon-saw and get a space sufficient to draw a tape through, I enter with these instruments and trim around the necks of the teeth. The rubber dam has protected the cavity; the cervical wall of the cavity can be seen perfectly. I then take a tape and work around the filling until I have it as beautifully shaped as any gold filling that could be put in.

Dr. Adams.—I thank you. That is what I listened for in your first remarks and did not get.

Dr. Watkins.—There is one thing that we should be very particular about, and that is the finishing of the filling, and especially an amalgam filling, the cervical walls of approximate cavities.

Dr. Louis C. Leroy, of New York.—The few remarks that I have to offer are quite in harmony with those of Dr. Watkins. I agree with him thoroughly, especially in what he says about more than filling the cavity with amalgam. That is perhaps more important than any other part of the operation of filling, aside from the finishing, because plastic fillings are very liable to be rubbed away.

When I read the announcement of this meeting, sent out by

your society, I wondered to what the society was tending. The American Society of Dental Surgeons some years ago sent out to its members a notice reading something like this: "Any member of this Society who shall hereafter refuse to sign a certificate pledging himself not to use any amalgam, under any circumstances, in his dental practice shall be expelled from the Society." There were eleven gentlemen expelled from that society under this rule. That was the society which preceded the American Dental Association. Evidently there has been a change of opinion since then, although Dr. Watkins says he rarely uses amalgam.

Dr. Watkins.—Oh, no. I did say, when I first spoke, that I would admit that I used amalgam.

Dr. Leroy.—I am glad you have corrected me in that. Let me quote Dr. Flagg on this occasion, who says, "The possibilities of amalgam are greater than those of all other filling-materials combined." I think so, too. If amalgam is used properly, as it should be, its possibilities for tooth conservation are greater than those of any other material. But, as in all other operations that we are obliged to perform, we must use judgment in the use of amalgam, giving the preference to gold in every instance where gold can be successfully used. I always endeavor to do that, but there are so many cases in which amalgam may be properly employed, even in contouring the whole tooth, using a matrix in the operation, that it is indispensable, and we can get marvellous results with it. I have many cases of such contouring in my practice that have given most excellent results. As to which is the best amalgam, it is difficult to say. I am using standard alloy; have had it in my office ever since I began practice; and it gives me such universally good results, and seems to be so unvarying in its excellence, that I have given it the preference. I have used Lawrence's amalgam, and it also seems to give very good results. The original formula was given by Dr. Flagg. Mr. DuBois was a patient of Dr. Flagg's, and they in conjunction brought forth the standard alloy.

Dr. S. B. Palmer ascribes the failure of fillings to "the incompatibility of the filling-material with the bone structure." The service which amalgam gives in tooth conservation depends principally upon the judgment of the operator, as the conservation of life depends largely upon the judgment of the physician.

I have been glancing over an article on amalgam and learn that it was first described under the name of silver paste, introduced in 1826 by Mr. Javeau, of Paris, and thought it might be of some interest to you as a matter of history.

I purchase my amalgam generally in four- or five-ounce quantities, particularly for the purpose of aging it, because there is something in the age of amalgam which gives better results. Another purpose is to get it at the lowest price, as I think that a man doing business should take advantage of all the opportunies that present themselves.

My next step in the handling of amalgam is to spread it out in a glass dish and run a magnet through it. You will be surprised to see what you get from it in that way; whether it be Lawrence's or Eckfeld & DuBois's or any other amalgam, I think you almost invariably find particles of steel in it. I used to wonder why there were little pin-like holes in some of my fillings after they were finished, and it occurred to me that they were due to particles of steel which became oxidized and disintegrated in the filling. After that I used a magnet, getting out of the amalgam varying quantities of little particles of steel.

As to washing the amalgam before using, although Dr. Flagg condemns that practice as being "absolutely detrimental," I believe that in my hands washing is an essential feature. I have for years almost invariably practised it. It removes the oxides. The washing should be done with pure alcohol. Alcohol does not dissolve the oxide, but simply holds it in solution; which is proved by the fact that the alcohol becomes almost clear again after being allowed to stand for a short time.

I think a most essential feature in the filling of a tooth with amalgam is to have the cavity perfectly dry when filling. I certainly am of the opinion that more of the failures with amalgam fillings are due to neglect in the matter of drying the cavities than to anything else. Many dentists are inclined to say, "Oh, it is only an amalgam filling; anything is sufficient." I do not think so. In some cases we may take the chances in using a napkin instead of the rubber dam. If the tooth-structure itself is conducive to good results, you may fill with almost anything or in any way, but with young people, below thirty years of age, I do not think one can safely take chances of that kind. We must be more cautious in the sterilizing and more positive in the drying out of the cavities.

A most essential feature in preventing the amalgam from showing through tooth-structure, so as to discolor it, is the method of lining the cavities with oxyphosphate. It should be used plastic, and the amalgam worked into the phosphate while this is in the plastic state. In that way you get a more homogeneous and positive union of the cement with the tooth-structure, and it undoubtedly

makes a more positive tooth-conserving filling than any other that I know of. Where the cavities are exceedingly large I almost invariably follow this method, covering the base of the cavity with gutta-percha.

Dr. Osmun.—I do not know, Mr. President, that I have much to add to the remarks that have been made. My method of using amalgam is somewhat different from those that have been described here to-night, and, as it is individual methods that have been called for, I will give you mine. After I have prepared the cavity, having it perfectly dry, and protected with either a napkin or a rubber dam, I put in the first pieces of amalgam very dry and hard, and work it down well into the undercuts with a burnisher, using bibulous paper, and making the amalgam dryer and dryer, harder and harder, until I have the cavity full. I must take exception to Dr. Watkins's recommendation about filling the cavity in excess. I think that is a mistake. To my mind there is danger of loosening the filling from its anchorage, in trimming it down, if there is an excess of amalgam. I prefer to fill with amalgam as I would with gold, burnishing it down as well as I can around the edges. I do not think I would like to follow the plan of Dr. Watkins; in my hands I doubt if it would be successful. I do not see anything in it to recommend, and I can see a good many things about it that I would not like to commend. There is danger of rocking the fillings.

The washing of amalgam was dropped by myself a long while ago. I did not see that anything was to be gained by it, and it seemed to me that it was detrimental. I do not know that I can explain why I thought so.

In regard to the question of which is the best amalgam, I do not think it makes very much difference which one you use so long as you use it properly,—I mean the first-class amalgams, made by the best manufacturers, such as White, Johnson & Lund, and De Sanno & Hussey. I think De Sanno & Hussey's has a little more of the desirable velvety feeling. It is very important to have the mass thoroughly amalgamated. It is a good plan, when thoroughly mixed and amalgamated, to start in and do it again. I tell my office-boy to mix it until he gets tired, and then I mix it till I get tired, and in the end it feels like velvet. It is difficult for an operator to describe how he performs an operation. He does it over and over again, and after awhile it becomes a sort of second nature to him, but it is difficult to put the whole operation into words so as to convey the idea to another mind.

As to the relative value of amalgam and gold as filling-materials,

I do not think that needs discussion. Every operator who gives the question a second thought knows, beyond peradventure, that amalgam is one of his sheet-anchors,—he must use it, but at the same time use it with discretion.

Dr. Richards.—Mr. President, I would like to ask Dr. Osmun what he means by the rocking of fillings when he spoke of separating two consolidated, approximate fillings. Would it not press them in tighter?

Dr. Osmun.—I do not know just how to explain that. Two approximate cavities are never exactly of the same size; you never have the margins of one exactly opposite the margins of the other. They are seldom of exactly the same depth and width, with exactly the same kind of buccal and lingual surfaces; and when the surplus amalgam between them is cut away with a ribbon-saw, or with a spatula, you are liable to chip away pieces in pulling the saw back and forth, and at the same time you are very apt to rock the fillings and loosen them. That would be my criticism of the method of filling the spaces between two approximate cavities. I never feel very well satisfied if I cannot see the margins from the beginning to the end of the operation. I do not like this filling down into a blind hole where you cannot see what you are doing, and that is exactly the case in the use of the matrix. My experience is that I have not had as good success with it as I have without it.

Dr. Watkins.—Mr. President, Dr. Osmun says he does not believe in filling cavities more than full and then trimming away the excess, for fear it would rock the fillings. To me that seems very amusing, almost ridiculous. After a filling has been packed in solid, as I propose to pack it, I do not think there is any such thing possible as rocking that filling. If the amalgam is pressed down thoroughly as you go along, getting a good anchorage and a solid filling and a hard surface, there is no such thing possible as rocking it.

Dr. Richards spoke of cutting away between the fillings; that, instead of rocking them, it would have a tendency to pack and press them in harder. That is not so either, because they are pressed in as hard as they can be; they are as solid as a rock, and movement is impossible.

There is another matter that I wanted to speak about to-night, if permitted,—a matter that will be of interest to all of you, perhaps. It is new to me, although it may not be new to all of you.

We are all bothered more or less at different times with pericementitis; occasionally we will come across a tooth that has been filled for ten or more years; perhaps the canals have not been thor-

oughly filled, although it has not given trouble for a long time, but all at once the patient appears with a swollen gum and more or less pain; in other cases we have just filled the tooth, and the patient goes home to return in a few days with an inflamed tooth. Those cases have troubled us all, and dental science has failed to give us anything that will overcome the difficulty and give the patient sure relief. Now, there is a preparation, one of the derivatives from coal-tar, known as ammonol,—many of you may know all about it,—which meets these cases beautifully. Unlike the other coal-tar preparations, ammonol does not depress the heart's action; it is practically harmless, it will destroy fever, and it will relieve pain. I have tried it in a good many cases lately. A lady came into my office about three weeks ago in the middle of the night with a tooth that had been filled some ten years ago. She was suffering intensely, the tooth was elongated, she could not close her mouth, and there was considerable swelling of the gums. I gave her forty grains of ammonol,—not at one time, however. I gave her ten grains at once, and told her to go home and take ten grains more in an hour, and five grains more each hour until relieved. She took ten grains when she arrived home, and she went to bed and slept and had no more pain. About forty hours afterwards she came to me again with the tooth uncomfortable, and I gave her then a prescription to get more ammonol. She did so, and took twenty-five grains of that, and that was the last of the pain; there was no more inflammation, and I have not had occasion to touch that tooth since, and do not expect to. I have had several cases of a similar character,—one the case of a lady who suffered terribly, and who was brought to me by her physician. Another dentist had opened the root-canals and had never put anything into them except a piece of cotton with some medicine into the main pulp-chamber, then closed it up with another portion of cotton dipped in sandarac varnish. In about a week an abscess formed, and she was suffering intensely when this physician brought her in. I had to brace her up with whiskey and spirits of ammonia to quiet her and prevent fainting while I removed the cotton. I treated the tooth, closed it up, gave her some ammanol, and sent her home; and that was the last of the trouble with that tooth. Only day before yesterday another lady came in with a tooth very painful and elongated, and in about the same condition as the one first described. I gave her thirty grains of ammonol. She went home, and after taking about twenty-five grains was completely cured. This drug seems to relieve the pain and dispel the inflammation,

and it is sure relief for the patient. Then in case of fever, you can break up a fever with it in a very short time. And if you want a stimulant for yourself to brace you up so that you can do an extra heavy day's work, take fifteen or twenty grains of ammanol in five-grain doses during the day, and you will not realize that you are tired at all: you can work right along.

Dr. Adams.—Mr. President, I want to add my testimony to the value of ammanol. I have been using it since last February in some cases of neuralgia in five-grain doses, and it has proved very effectual. I have given it to patients who were in great pain, to be taken at home, and it has almost invariably put them to sleep and made them comfortable. I do not administer it in larger doses than five grains, at intervals of two hours. In these cases in my experience it has dissipated the pain, and the patient has been made comfortable and happy.

Dr. Watkins.—It is an almost harmless remedy; there is no danger in giving fifteen to twenty-five grains. In some cases I have started in with ten or fifteen grains, and without any bad effect.

A voice.—By whom is it prepared? 18 East 17th St. N. Y.

Dr. Watkins.—The Ammanol Chemical Company, 36 East Fourteenth Street, New York. There was another preparation that I wanted to speak of, something in the same line, that I am experimenting with, and which I do not think any of you have tried. It works beautifully. I think I will give it to you at the next meeting.

Dr. Adams.—Mr. President, before the subject of amalgam is passed I want to say a few words. I was very glad to see the subject announced for the meeting to-night. There is one thing that my experience and observation has taught me, and that is that there are many men in our profession who seem to think that because a filling is to be of amalgam, there is no particular necessity of doing as thorough and careful work as they would do if they were making a gold filling, and I think that is a great error. My experience has been that when you begin to bur out a small cavity in the grinding surface of a molar, and follow the fissures leading from it, you generally find a much larger cavity than you expected. Now, if that cavity were to be filled with amalgam in the centre of the tooth, and finished off without burring out those fissures which extend in a crucial form across the crown of the tooth, at the end of a few months, when the patient returns, it will be found that an excavator can easily be inserted around the edges of the filling. I

feel prompted to say this because my observation has led me, in the twenty years that I have been in practice, to see the necessity for using as much care in the preparation of a cavity for an amalgam filling as there is in the preparation of a cavity for a gold filling; and the man who thoroughly removes the tissue around such crown cavities, and prepares them as he would prepare them for a gold filling, will find at the end of one, two, or three years that he has a filling there that is just as good as it was the day he finished it.

Dr. Adelberg.—Mr. President, I think Dr. Adams's last words struck the key-note in the making of a perfect amalgam filling,—the finishing. When an amalgam filling leaves your hands you never feel that it is completed until you see it again; that it is not a perfect filling until you have inspected it and know that it is thoroughly finished. If you would pay more attention to the finishing of amalgam fillings after they leave your hands the first day, having the patient return for the purpose of finishing, I think that this deficient edge-strength, shrinkage, and all that sort of thing will be done away with.

Dr. Barlow.—Permit me a word, Mr. President, in reference to the finishing of amalgam fillings with tape. That is something that I very seldom do. I use a burnisher and bibulous paper. I cut the bibulous paper into strips a couple of inches in length and fold them three or four times, then work them down about the filling, drawing them across the surface of the filling so as to conform it to the tooth. The bibulous paper carries away all the surplus mercury from the amalgam that may have been deposited below the margins, and the whole makes a nice clean filling. I consider that tape on an amalgam filling is altogether too coarse a thing to use; it tears away the amalgam instead of carrying it to an edge.

Dr. Watkins.—Mr. President, in answer to Dr. Barlow, I would like to say that I have used bibulous paper for twenty years, whenever I could not get fine linen tape. I do not know whether Dr. Barlow has had experience in using fine tape or not; but if he could use such tape as Dr. Adams has used, and such as I use now, he would not want to use bibulous paper except on very rare occasions. If the tape is fine, as it should be, and properly handled, it will polish down an amalgam filling beautifully, leaving cleaner cut edges and a smoother surface than bibulous paper can possibly do. An objection to bibulous paper is that it is liable to double-up and get thick, and in that way dig into the filling if it is at all soft,

such as I imagine Dr. Barlow had reference to, and if a little too much pressure be used, then it breaks; but with a fine tape you can manipulate it exactly as you please, and it leaves a smooth surface.

Dr. Barlow.—Dr. Watkins may be more proficient in the use of the tape than I am, and I may be more proficient in the use of bibulous paper than he is.

Dr. Mitchell.—Mr. President, there is one important point in making an amalgam filling on the grinding surface of a molar, that is, to get the lip a little low, so that the impact of mastication will not bear on it too heavily, because I have found that sometimes in such cases the delicate walls are broken away by the motion of mastication, and the fillings drop out. That is one point that I think has not been brought out. I make more amalgam fillings than any other kind, because that is what they want down in Bayonne, and I find I have to look out for the leverage very carefully.

Dr. Meeker.—Mr. President, Dr. Flagg's series of experiments with amalgam were probably the most extensive and the most scientific of any that have been made in this country; he had specimens from the best metallurgists; his experiments were conducted on strictly scientific principles, the fillings being made in steel dies, and he showed the difference in the shrinkage of apparently the same amalgams when subjected to exact conditions. Now, these experiments show that the question of the best amalgam filling resolves itself into this one thing,—manipulation. If we have imperfect amalgam fillings, it is due to poor manipulation, or to abnormal conditions of the mouth. I know that I have made some poor amalgam fillings in my life, and I occasionally see some of my amalgam fillings put in twenty years ago that are still good. I find most of those old fillings made of Blackwood's amalgam, which is about the same as Lawrence's; the formula of both is nearly the same. I have used the De Sanno & Hussey's amalgam for six or eight months, and, like Dr. Osmun, I find it a very fine and velvety material; it is exceedingly smooth and velvety when you work it, and it gives a good edge-strength, and unless there is some abnormal condition of the mouth it will keep its color well. One thing about De Sanno & Hussey's amalgam is that the manufacturers come around at stated times and take away all your scraps, refine them, and give you as the result a good amalgam at fifty cents an ounce. I had about thirteen ounces the last time; I have used quite a little of it, and I am watching it. They add some

metal to it, probably silver; but in whatever way they treat it, it wears just as well, apparently, as more costly amalgam.

I have here the printed proceedings of the meeting of 1895 of the State Society; it is somewhat ancient history, but I wish the members of the State Society who are here to-night, and who would like to have copies of these proceedings, would take them now and save me the trouble of sending them by mail.

Dr. Leroy.—There is one bad practice that I have noticed some dentists indulge in in preparing amalgam,—that is, using a two-per-cent. solution of sulphuric acid. I have always failed to see the real virtue of that, except that it removes some of the oxide, which I presume the washing of amalgam mainly means. If there are any here who have used sulphuric acid in that way, and who can say anything in defence of it, I would like to hear it.

Dr. Meeker.—I have used sulphuric acid, and I have used bicarbonate of soda, and I have used alcohol; but I do not see that washing with them makes any difference in the fillings in regard to color. I think it resolves itself down to careful manipulation of the filling.

On motion, the subject was passed.

Dr. Watkins.—Mr. President, there is another subject in which we are all interested, that is the painless extraction of teeth by means of the injection of some preparation into the gum. I have been using to some extent for that purpose a preparation called "eucaine." Eucaine is somewhat similar to cocaine, only less poisonous; it is practically safe. You can inject a five- or ten-per-cent. solution into the gum each side of the root, only a short time is required for its effect, from three to five or eight minims is a sufficient quantity, and you can extract the tooth usually with absolutely no pain. It has worked better in my hands than any other preparation that I have tried. The other day I had a case to prepare for an upper and under set, nothing but roots to remove. I made two injections, first from one wisdom-tooth to the central, then extracted all the roots on that side; then injected from the other wisdom-tooth to the central and extracted on the other side. There was no pain except in the removal of each of the wisdom-teeth. Perhaps I did not introduce quite enough of the remedy, or did not leave it long enough at that point. As to the rest, the patient said it was absolutely without pain. I have used this eucaine in quite a number of cases, and it works nicely, seems to be harmless, and leaves no sore mouth afterwards.

Dr. Richards.—Mr. President, what has been said about eucaine

I know to be correct. I had my druggist mix some for me in distilled water. I used it this morning on a very peculiarly nervous patient, in extracting a left lower cuspid; it was a very long root; I used two syringefuls,—a small glass hypodermic syringe.

Dr. Watkins.—I only used two syringefuls in the whole upper jaw.

Dr. Richards.—I admit it was a rather large quantity; she never moved a muscle, and I removed the tooth without any pain whatever. I was surprised at the result. I asked her if she felt badly afterwards, and she said, "No."

Dr. Watkins.—Eucaine comes in the same form as hydrochlorate of cocaine, and requires to be prepared in distilled water, then boiled. You set it in a tin basin of water and boil it. Then you have it absolutely pure and free from germicides. Wipe the gum clean with a weak solution of carbolic acid and you will be introducing no poison, and will create no inflammation.

Dr. Meeker.—There is one thing about cocaine that I think you ought to know: that is it decomposes in forty-eight hours. You need to prepare it fresh when you use it; if it is more than forty-eight hours old, it will not give good results.

Dr. Watkins.—Mr. President, I would like to say in regard to eucaine that, unlike cocaine, it will keep indefinitely; it will keep until it is used up.

Adjourned.

Editorial.

THE NEEDS OF THE FUTURE.

The opening of the New Year is apt to be as productive of thought as the passing away of the Old; but these reflections are as ancient, probably, as human intelligence, and may or may not lead to improved methods or a higher motive to action. The fact, nevertheless, remains that it is only by constant iteration upon ethical themes that man, in the concrete, develops into a higher standard. It is upon this constant repetition of what some may regard as platitudes that the moral life of civilization is founded, and the effect can only be observed by a careful analysis of the history of peoples as they have advanced slowly and painfully, step

by step, to higher conceptions of duty to themselves and the world of which they form a part.

Professions are not exempt from this law of the moral life. They grow by silent and almost imperceptible accretions, here a little and there a little; but ever the superstructure develops slowly into a compact body, worthy the respect and confidence of the community.

When dentistry is studied in its historical relations, the facts clearly show that it has been only by slow additions and through the work of a multitude of minds that it has reached present proportions, and what is true of dentistry is equally true of all the scientific work of the world.

The relation which each individual bears to the whole is well understood and requires no argument to demonstrate its force. Without combination nothing can be gained, and it is equally true that if the separate parts lack vitality the entire body will exhibit a corresponding weakness.

Accepting this view, what seems to be the duty of the individual in the coming time? As the individual is the integral part of the whole and represents it, it becomes the imperative duty of each to labor in his chosen department, that the sum of all the experience may represent the character of the entire body.

This is undoubtedly recognized by the few, and the work accomplished in the dental world, in the past few years, is in marked contrast to that which has preceded the present era; but the question arises, Is there not room for improvement among the masses that constitute the workers of this special calling?

The defect that must impress all readers of our literature is, that a large proportion of it is extremely weak from a scientific point of observation. The dental periodicals of the day teem with papers, some of them of lasting value, but the majority add nothing to the knowledge of the world upon the special subjects treated. The cause of this is not remote, but is to be attributed in part to the methods adopted by writers in general. The fault may, however, lie not so much with individuals as with societies. The latter must have essays to keep up the interest, and the demand is constant upon writers to supply the want. The temptation is an ever present one to comply. The paper is prepared, not from original investigations, but from the evolution of ideas in the individual brain, copiously illustrated by quotations from various authors. Assertions are dogmatically presented that have no other foundation than the crude conception of the person making them. It is no unusual thing to find writers

boldly criticising the original investigations of others and, with a word, setting them aside as of no value. This not only leads to wrong thinking on the part of readers, but is a discouragement to original effort. The only true method is to either prove, by similar work, the truth of given facts or to antagonize them by similar labor.

It would, therefore, seem for the true development of the dentistry of the future that there should be an increase of scientific work. This can best be accomplished by societies demanding that the papers presented to them shall show originality, and by originality is meant not a mere dressing up of words into new combinations, but the evidence that the subject-matter comes fresh from the laboratory.

It may be argued that if this were adopted there would be nothing presented. This, unquestionably, is true of the present; but it does not, therefore, follow that no effort should be made to effect a change for the better. The amount of printed matter sent out to the world in the past, especially from this country, contains an amount of verbiage that is anything but creditable to dentistry. The weakness of the essay produces, as a necessary sequence, a similar result in the discussions which follow. Everything should be aimed towards thorough scientific work, and with an amount of proper stimulation brought to bear upon the new dentists of the period, a change must come, in the near future, which will make the old methods of procedure assume, to the new generation of workers, a grotesque character. The only true foundation, therefore, for a paper, on any subject, is scientific labor, or, a better phrasing, original investigation. It may not reach all of truth, but it will aid in clearing up disputed points, and will prove to be for the future investigator a mine of information for the final completion of his work.

The study of any subject presupposes a knowledge of all that has preceded it on that special line of investigation. There is, perhaps, nothing so annoying to the continuous reader as to find essayists stating supposed new things which the history of his profession reveals to him to be so old that their origin almost antedates professional memory, and yet it is well known that this is constantly being done by writers. To obviate this it should be one of the first duties of societies to establish professional libraries. It is not possible for every dentist to accumulate books, but it is possible for every local organization to build up a collection of infinite value as a library of reference. The importance of this is becoming apparent, and in

the coming time these will be established in every professional centre.

The subject of organization is one that will be fully considered in the near future. The dental profession has followed precedent in this matter, and has taken the experience of the medical profession as its own. This has not worked altogether satisfactorily, and will never be in harmony with existing advanced ideas until these methods are changed. The discussion now in progress will, doubtless, produce good results, but there is evidently a feeling abroad to let things take their course. This is never a wise method. When a defect is discovered, the earlier measures are taken to remove it the better, and the many defects of dental organizations throughout the country are so apparent that the hour is ripe for a concentrated influence to be brought to bear to effect a change.

It is hoped the New Year will, at least, show an effort in the higher development of all organized bodies upon the lines suggested. Change cannot come suddenly; but if original investigation be encouraged and the writing of papers of no special value be discouraged, the gain will soon be apparent, and the dental profession in the United States will eventually be worthy of its name.

CORRECTION OF DR. RICHARDS'S PAPER.

In Dr. Richards's paper on "Nasal Obstructions," September issue, on—

Page 550, line 11 from bottom, instead of "never communicate" read "occasionally though very rarely communicate."

Page 552, line 4, instead of "ciliated" read "cylindrical."

Page 552, line 5, instead of pavement-celled" read "ciliated."

Bibliography.

COMPEND OF DENTAL PATHOLOGY AND THERAPEUTICS. By Henry H. Burchard, M.D., D.D.S. Special Lecturer upon Dental Pathology and Therapeutics, Philadelphia Dental College. Philadelphia: The S. S. White Dental Manufacturing Company, 1896.

It is, perhaps, unreasonable to expect that compends will ever cease to be issued while the demand exists for a short road to knowledge, and, while it is to be regretted that such a demand does exist, it is a satisfaction to find that this class of books shows a continued improvement.

The present volume is not prepared, as the author states in his preface, "as an aid to students in memorizing answers for an examination," and yet it is feared it will have exactly that result. The author has "prepared it primarily for students attending his own lectures," and it is hoped that the generally clear definitions of pathological conditions will have a beneficial result.

Books of this character defy criticism, as they give the briefest outline of the subjects treated,—in fact, in many instances tend to lead the student astray. The author has, in this effort, succeeded very well in condensing facts, as he understands them, and has evidently tried, and with excellent success, to give a consensus of the various opinions held by writers upon the pathology of the oral cavity; but the natural result of a question and a brief answer is a tendency to dogmatism, and this is frequently apparent throughout the pages of the book. Its greatest defect, common to all such books, is the effort to condense into a few lines that which should require pages of description.

It seems to the writer that it is a mistake for a teacher to issue such a book for his students. The experience has been of all those long in the service that such compends invariably end in becoming a plague to the author, and, it is surmised, this will be no exception.

The book can be recommended as one of the best of its class, and its contents will not only be appreciated by students, Boards of Examiners, but all that class who aim at a superficial knowledge of dental pathology.

Thérapeutique de la Bouche et des Dents, Hygiène Buccale et Anesthésie Dentaire. Par le Dr. Maurice Roy, Dentiste des Hôpitaux de Paris, etc. Librairie J. B. Baillière et Fils. Paris, 1897.

This is a compend of dental therapeutics, and has similar uses for French students as that heretofore described under Dr. Burchard's book. It combines a description of all remedial agents used in dentistry and the method of treatment, the administration of anæsthetics, with the necessary precautions to be taken, contra-indications in administration, and the care necessary in case of serious results. The author very properly gives credit for the discovery of anæsthesia to Horace Wells, and the use of ether to Jackson and Morton.

The book, small as it is, contains a variety of information, and becomes, in this sense, worthy a place among books of reference. Its defects are common to all compends.

Domestic Correspondence.

CALCULUS IN SUBLINGUAL GLAND.

To the Editor:

Sir,—The paper by Dr. Fütterer on salivary calculi, in the October number of your Journal, brings to my mind a case which came to me for treatment some time ago. Miss H., aged about twenty-one years, presented herself suffering with pain in a right lower incisor: as the tooth did not respond to applications of chloride of methyl, it was opened, and the tooth found to be in a dying but not putrescent condition. After removing the pulp, the lower third of which was in a comparatively normal state, a dressing of cassia oil was inserted, and the patient dismissed.

The next day the patient presented herself with face somewhat swollen and no diminution of pain. As to my mind the pain could no longer be from the tooth, I made a careful examination of the mouth and found an abscess of the right sublingual gland "pointing" towards the median line. Dr. Felix Cohn, who saw the case in consultation, expressed the opinion that the abscess was a result

of infection from the tooth. After incising the abscess and evacuating the pus the gland was probed, but nothing discovered.

The wound was then packed with gauze and the patient ordered to return that evening. On removing the gauze a hard object was seen which proved to be a calculus the size of a cherry pit. The next morning another calculus somewhat smaller in size was removed.

Now the question which arises is, Was the fact that the gland abscess and the pulpitis took place about the same time, as in my opinion, merely a coincidence, or did the suppuration ensue in consequence of the invasion of micrococci from the tooth?

Dr. Cohn held the opinion that while of course the calculi must have been present for a long time, there would have been no pus-formation until the infection took place.

S. L. Goldsmith.

EXPERIMENTS IN CATAPHORESIS.

To the Editor:

Sir,—Inasmuch as cataphoresis is just at present attracting much attention in the dental and medical world, perhaps the following experiments, held in the infirmary of the Columbian University, Dental Department, may prove of interest to the profession.

The apparatus used was that of The Chloride of Silver Dry-Cell Battery Company, of Baltimore, the medicament was thirty per cent. solution (freshly made) of cocaine.

Case I.—Student with compound approximal cavity in first upper molar, decidedly sensitive, and white decay. The dam was applied, a cotton pellet, moistened with the solution cocaine, placed in the dried cavity, the positive pole on the cotton, and the negative at the patient's wrist.

In ten minutes all sensibility was destroyed and the decay removed with the engine-bur, without any attempt at gentleness, the patient feeling no pain whatever.

The cavity was then filled with gold, and during the process of finishing it was noticed that heat from the emery disk caused discomfort, showing a return to normal sensibility.

Case II.—Female, cervico-buccal cavity, shallow and very sensitive; the treatment, time, and results in every way similar to Case I.

Case III.—Female, second lower bicuspid, pulp almost exposed, violent pain for some days. Patient worn out from loss of sleep, etc.

The dam was applied, cavity dried, and the softened substance over pulp gently raised, this being followed by a drop of blood from that organ. The thirty-per-cent. cocaine solution (warmed) on cotton was placed against the pulp, and the electrical current very slowly applied and increased in intensity with like care.

The patient was much frightened at the preparations, and some time was lost in quieting her.

For ten minutes she complained of pain about equal to that of the original ache, but of a different nature; this gradually subsided, and in thirty-five minutes from the time of turning on the current, the pulp was removed entire, with a Donaldson broach, without the patient feeling it in the slightest degree.

(Query: Does not this latter fact prove that the cocaine passes beyond the foramen?)

The root and cavity were at once filled.

J. Hall Lewis, D.D.S.,
Dean.

Current News.

THE INTERNATIONAL TOOTH-CROWN COMPANY *VERSUS* ALLAN G. BENNETT.

UNITED STATES CIRCUIT COURT OF APPEALS, SECOND CIRCUIT.

The International Tooth Crown Company, complainant and appellant, *vs.* Allan G. Bennett, respondent and appellee.

This is an appeal from a decree of the United States Circuit Court, Eastern District of New York, dismissing the bill. The suit is brought to enjoin infringement of Letters Patent No. 238,940, issued March 15, 1881, to James E. Low for an improvement in dentistry. Suit was heretofore brought by this complainant in the Southern District of New York on the same patent (with others) against one Richmond; the patent was sustained and infringement found (30 Fed. Rep. 775). In the suit at bar the Circuit Court

found a prior use, anticipating the patentee's invention, and for that reason dismissed the bill (72 Fed. Rep. 169).

Per Curiam. We do not deem it necessary to add anything to the discussion of the case in the Circuit Court. We concur with the learned judge who tried the cause in the conclusion that the real invention of the patentee was a device (consisting of a band or cap and attachments thereto) for permanently inserting artificial teeth without the use of a plate, and without using the gum as a support to the artificial denture, his device holding the tooth in place with sufficient strength to stand the strain of ordinary mastication by attaching it rigidly to the natural dentition. This invention could be put in practice by rigidly attaching the artificial tooth either to a single natural tooth adjoining it on one side, or to two adjoining natural teeth, one on each side.

The specification of the patent sets forth that:

"A band of gold or other suitable metal is first prepared and accurately fitted around the tooth adjacent to the vacant spaces to be supplied with an artificial tooth. This band is firmly secured in place by cement, which effectually excludes water or the fluids of the mouth, and is thus permanently attached to the tooth so that it cannot be removed without an operation directly for that purpose. It is sometimes sufficient to prepare one of the adjacent teeth in this way; but generally it is desirable to prepare the adjacent teeth on each side of the vacant space. It will always be advisable to do so if the vacant place is to be occupied with more than one tooth."

The invention is not a bridge with two abutments. A bridge with abutments existed in the prior art. The contribution which Low's patent undertook to make to the art was an improved kind of abutment, and that improvement would be availed of when the process pointed out in the above quotation was applied to a single tooth. The circumstance that in the first claim the words "bands" and "permanent teeth" are in the plural is not significant. The language is made broad enough to cover the process generally, and for that reason uses the plural. It claims "the herein-described method of inserting and supporting artificial teeth," but certainly no one would contend that because of the use of the words "artificial *teeth*" in the plural the claim would not be infringed by the insertion of a single tooth. If the patent were valid the insertion of a single artificial tooth firmly secured to a band of gold accurately fitted and cemented to a natural tooth adjacent to the vacant space to be filled with such artificial tooth, and wholly supported

by its attachment to such adjacent natural tooth, without dependence on the gum beneath said artificial tooth, would be an infringement. If this were done before the application for the patent it would be an anticipation. The evidence that this is what was done in the case of Mrs. Mertz is to our minds clear and convincing. The date is established beyond a doubt, and it is equally certain that the artificial tooth thus attached was used for years. We concur, therefore, with the judge who heard the cause in the Circuit Court that the so-called "Beardslee-Mertz 1877 Permanent Bridge" is an anticipation of the device of the patent.

Complainant contends that the Beardslee-Mertz device does not anticipate the second claim of the patent. The specification, referring to the artificial block or tooth, says, "The lower surface adjacent to the gum is cut away at the back, and only descends to contact with the gum along its front edge, so as to prevent the appearance of an open space between the artificial teeth and the gum." The second claim reads as follows:

"An artificial tooth cut away at the back, so as not to present any contact with the gum except along its front lower edge, and supported by rigid attachment to one or more adjoining permanent teeth, substantially as and for the purpose set forth."

Complainant's counsel in argument and brief contends that in the Beardslee-Mertz device the artificial tooth is not cut away at the back. The very device, however, which was worn by Mrs. Mertz for years has been produced, and, while it is not cut away in the back as much as are the devices shown in the drawing of the patent, it is manifestly sloped upward, so as not to bear upon the gums. The extent to which the back is cut away is immaterial, so long as the cutting away is sufficient to avoid pressure on the gum and leave the artificial tooth or block supported wholly by attachment to the natural dentition. Complainant's own expert, speaking of the Beardslee-Mertz device, says,—

"If the teeth—that is, the artificial crowns—did not bear upon the gums, and were properly and sufficiently supported by adjacent caps or crowns, and the dates were early enough, I suppose they would meet that portion of the second claim of the patent in suit wherein a single natural tooth is used as a support for an adjacent artificial tooth, without bringing the artificial tooth in contact with the gum."

The date is definitely fixed, and the evidence shows that the artificial crown did not bear upon the gum, and was properly and sufficiently supported by the adjacent cap around the crown of the

adjacent tooth. Under the construction which must be given to the patent as indicated above, the Beardslee-Mertz device anticipates the second claim as well as the first.

The decree of the Circuit Court is affirmed with costs.

Judges Lacombe and Townsend.

PENNSYLVANIA ASSOCIATION OF DENTAL SURGEONS.

At the annual meeting of the Pennsylvania Association of Dental Surgeons, held on the evening of the 13th October, the following officers were elected to serve for the ensuing year. President, Naaman H. Reyser; Vice-President, Rupert G. Beale; Recording Secretary, Theodore F. Chupein; Treasurer, Wm. H. Trueman.

THE NEW YORK INSTITUTE OF STOMATOLOGY.

At the annual meeting of The New York Institute of Stomatology, held Tuesday evening, December 1, 1896, at the residence of Dr. W. E. Hoag, the following officers were chosen for the ensuing year: President, George S. Allan; Vice-President, E. A. Bogue; Recording Secretary, W. St. George Elliott; Corresponding Secretary, George A. Wilson; Treasurer, J. Adams Bishop; Curator, Z. T. Sailer; Editor, S. E. Davenport.

Executive Committee.—C. A. Woodward, chairman; J. Morgan Howe, A. H. Brockway.

THE

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Original Communications.[1]

THE DEGENERATE JAWS AND TEETH.[2]

BY EUGENE S. TALBOT, M.D., D.D.S.[3]

NEXT to the ears, the jaws and teeth (as was to be expected from the variability of these organs in allied animals) are most affected by degeneracy. This is particularly true of the vertebrates, especially the mammals, as might have been anticipated from their phylogeny or line of descent. At the head of the vertebrates is man; at the foot is the lancelet (*amphioxus*), most akin to the semi-vertebrates the ascidians, who, in their larval phase, are higher than when adult, and whose life history excellently illustrates that potent phase of evolution, degeneracy.[4]

The lancelet[5] has a spinal cord inclosed in a soft semi-cartilaginous canal (the notochord). It is practically destitute of a brain. The cerebral vesicle which represents this is a plain cavity without true subdivision into ventricles. There is no cranium and the median eye is a mere pigment spot with which it is able to distin-

[1] The editor and publishers are not responsible for the views of authors of papers published in this department, nor for any claim to novelty, or otherwise, that may be made by them. No papers will be received for this department that have appeared in any other journal published in the country.

[2] Read in the Section on Neurology and Medical Jurisprudence at the Forty-seventh Annual Meeting of the American Medical Association, held at Atlanta, Ga., May 5 to 8, 1896. Reprinted from the Journal of the American Medical Association by special request.—[ED.]

[3] Fellow of Chicago Academy of Medicine.

[4] Ray Lankester, Degeneracy, a Phase of Evolution.

[5] Willey, The Amphioxus.

guish light from darkness. Behind this is a small pit lined with cilia for olfactory purposes. Into this the cerebral vesicle of the larval lancelet opens. The mouth is well guarded against the intrusion of noxious substances, which have to pass through a vestibule richly provided with sensitive epithelial cells resembling the taste-buds of the human mouth. There is no heart. In this the lancelet is lower than the ascidians, the insects, crustacea, and many mollusks. It approximates the worms, which, despite a very elaborate vascular system, are destitute of a heart, the function of which is performed by contractile blood-vessels. From an embryologic and morphologic stand-point, the proximate ancestor of the vertebrates seems to have been a free swimming animal intermediate between an ascidian tadpole and the lancelet, while the primordial ancestor was a worm-like animal organized on a level with the starfish. The vertebrates, embryologically, develop from this stage to the lampreys, thence to the cartilaginous fish (shark), to the amphibia (frog, toad, axolotl), to the reptiles, and thence to the oviparous mammals (duckbill and spiny ant-eater), to the lemurs, and through forms like the pithecanthropus erectus to man. The present study will be confined to the mammals, passing from the simple types of teeth found in that oviparous edentate, the spiny ant-eater (echidna) of Australia to the indeciduous ancestors of the sloths and armadilloes and their descendants, inclusive of the dolphins and whales, whose teeth, both in fœtal Greenland and adult sperm-whale, preserve this old type. The whales,[1] it should be remembered, have degenerated from the hoofed mammals to suit their environment. While, as in the edentates, these teeth may be few, they may also (as in the insectivorous marsupials) approximate those of the reptilia in number (sixty or seventy on a side) and characteristic location.

The evolution of this primitive tooth to the bicuspid and molar type has been explained by two theories; the concrescence theory and the differentiation. The first, advanced by Magitot in 1877, was later advocated by Schwalbe, Carl Röse, and Kürkenthal. The last was offered by Osborn and Cope. Of these two contrasted theories Osborn[2] has given the following lucid presentation:

"Now let me illustrate, in a very simple manner, what is meant by the theory of concrescence and how we can imagine that the human molars have been built up by bringing together a number

[1] Haeckel, History of Creation, p. 242, vol. ii.

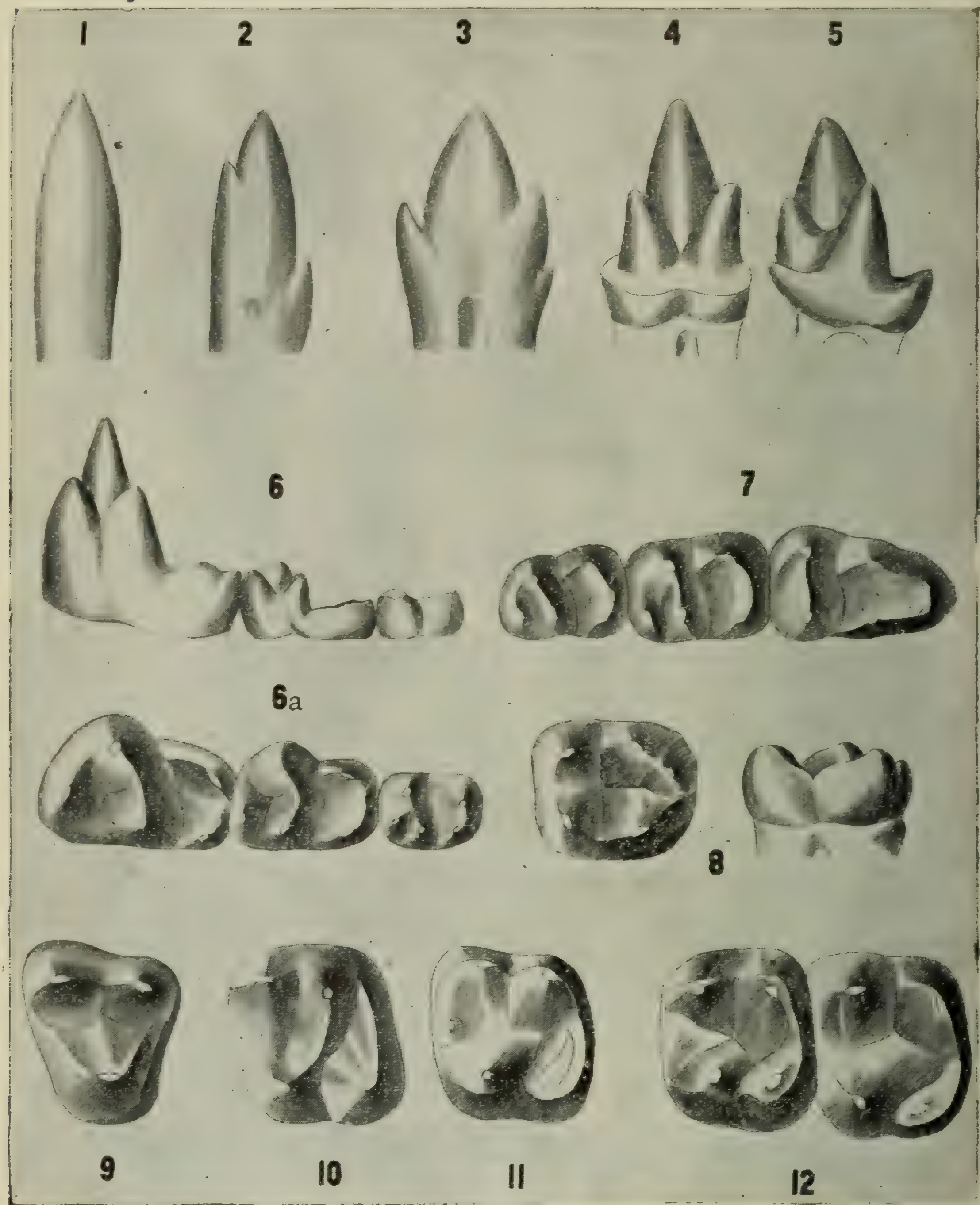
[2] International Dental Journal, July, 1895.

of isolated teeth. Placing a number of conical teeth in line, as they lie in the jaw of the whale, they would represent the primitive dentition. In the course of time a number of these teeth would become clustered together in such a manner as to form the four cusps of a human molar, each one of the whale-tooth points taking the place of one of the cusps of the mammalian tooth,—in other words, by a concrescence, four teeth would be brought into one so as to constitute the four cusps of the molar crown. Vertically succeeding teeth might also be grouped. Now, what evidence is there in favor of this theory, and what is there against it? First, there is this, that all primitive types of reptiles from which the mammalians have descended and many existing mammals, as we have noted, have a large number of isolated teeth of a conical form; secondly, we find that by a shortening of the jaw, the dental fold or embryonic fold, from which each of the numerous tooth-caps is budded off in the course of development, may be supposed to have been brought together in such a manner that cusps which were originally stretched out in a line would be brought together so as to form groups of a variable number of cusps according to the more or less complex pattern of the crown. What may be advanced against this theory? This, and it is conclusive to my mind: We find at the present time that cusps, quite similar in all respects to each of the cusps which form the angles of the human molar, are even now being added to the teeth in certain types of animals, such as the elephant, whose molar teeth cusps are being complicated now or until very recent times. Then we find in the mesozoic period certain animals with tricuspid teeth. Now, according to the theory of concrescence these teeth ought not to show any increase of cusps in later geologic periods; but as we come through the ages nearer to the present time we find that the successors of those animals show a very much larger number of cusps. How is this increase of cusps to be accounted for? Has there been a reserve store of conical teeth to increase the cluster? No. Most obviously, to every student of the fossil history of cusps there is no reserve store, but new cusps are constantly rising up on the original crown itself by cusp addition. However, do not let me give you the impression that these researches of Röse and Kürkenthal are not of the greatest value and interest; we shall see later on how the very facts of embryology which are advanced by Dr. Carl Röse in support of his hypothesis can be turned against him and used to support the differentiation theory.

"Now let us turn to the differentiation theory and see what evi-

dence we have of that. Let us go back to a very remote period of time, through the geologic ages of the pliocene and the miocene,

PLATE A.



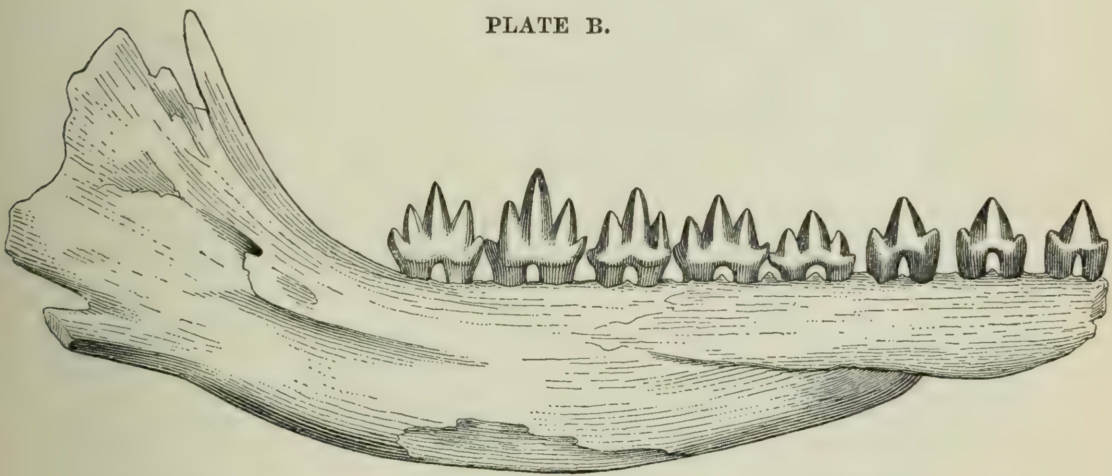
through the eocene, through the cretaceous or chalk period, and even the jurassic. Still further back we go to the triassic, and the interval between this and the present period has been estimated

at over ten million years. Now, in the triassic we find the mammalia, or the first animals which we can recognize as mammalia, possess conical, round, reptilian, or dolphin-like teeth. There are also some aberrant types which possess complex or multitubercular teeth.

"These teeth begin to show the first traces of cusp addition, as shown in the plate at the beginning of this article and in the accompanying key to this plate.

"Here (Fig. 1, Plate A) we have represented the teeth of the *dromatherium*, an animal found in this country in the coal-beds of North Carolina, and on the sides of the main cone are cusps or rudimentary capsules. In this enlarged model you see that on either side of the main cone are two cupsules. These teeth were

PLATE B.



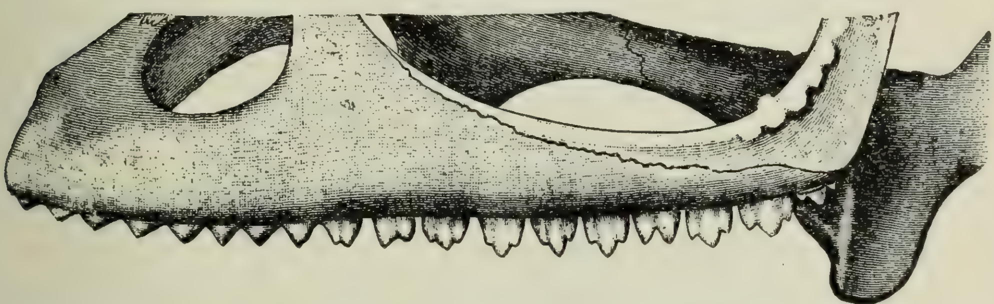
found six hundred feet below the surface in a coal-mine, and in the same mine we find another animal, represented by a single tooth here (Fig. 2), in which these cusps are slightly larger. These cusps have obviously been added to the side of the tooth, and are now growing. Then we pass to teeth of the jurassic period, found in large numbers both in America and in England, but still of very minute size; and we observe the same three cusps, but these cusps have now taken two different positions; in one case they have the arrangement represented in Plate B; the middle cusp is relatively lower, and the lateral cusps are relatively higher; in fact, these cones are almost equal in size; these teeth are termed *triconodont*, as having three nearly equal cones. But associated with this of *triconodont* is another animal named *spalacotherium*, the teeth type of which are represented in Fig. 4. This is one of the most significant teeth which we have among all the fossil series, because this tooth illus-

trates the step that was taken in the transformation of a tooth (triconodont) with three cusps in line to a tooth with three cusps forming a *triangle;* for the primitive cusp is now seen to be the apex of a triangle, of which the two lateral cusps are the base. Now, this fact in itself is of great significance, because this tooth in this single genus is the key of comparison of the teeth of all mammalia of the great class to which man belongs. By this we are able, as you shall see, to determine that part of a human molar which corresponds with a conical reptilian tooth. The stage shown you is the triangle stage; the next stage is the development of a heel or spur upon this triangle, as you see in Fig. 5, *amphitherium.* To sum up: We have a reptilian cone, two cusps added to it, and a heel,—four cusps altogether,—and we shall now see what relation these bear to the human molar. First let us turn to some transitional forms. Examine a molar of the living opossum, a marsupial, which still distinctly preserves the ancient triangle. Look at it in profile, in side, or in top view, and see that the anterior part of that tooth is unmodified. This triangle we also trace through a number of intermediate types. In this figure (Fig. 6) of *miacis,* a primitive carnivore, we observe a high triangle and a heel, and when we come to look at it from above (Fig. 6*a*) we find that the heel has spread out broader, so that it is as broad as the triangle. Now, the three molars of this animal illustrate a most important principle,—namely, that the anterior triangular portion of the crown has been simply levelled down to the posterior portion of the crown. Compare these three teeth, therefore, and you see illustrated a series of intermediate steps between a most ancient molar and the modern molar of the human type. The second tooth is half-way between the first and third. Look at the second molar from above and you see it has exactly the same cusps as the first, so it is not difficult to recognize that each cusp has been directly derived from its fellow. Now direct attention to the third tooth of the series (Fig. 7), for it is of equal significance with the others. This tooth has lost one of its cusps; it has lost a cusp of the triangle. It is now a tooth with only half the triangle left on the anterior side, and with a very long heel. That tooth has exactly the same pattern as the lower human molar tooth (Fig. 8); the only difference is that the heel is somewhat more prolonged. These teeth belong to one of the oldest fossil monkeys, *anaptomorphus.* I have no doubt many of you have observed, in the examination of human lower molars that occasionally instead of having four cusps they have five. The fifth cusp always appears in the middle of the heel, does it not, or

between the posterior lingual and the posterior buccal? You find this in the monkeys and in many other mammals, but I know of no record of the ancient anterior lingual reappearing. So we see that the human lower molar tooth with its low, quadritubercular crown has evolved by addition of cusps and by gradual modelling from a high-crowned, simple-pointed tooth."

Carl Röse[1] has contributed considerably to our knowledge of the evolution of the teeth. He says, "I find no mention in literature of the development of the teeth of the chamæleonidæ, nor of any other acrodont reptile. As the chameleon possesses multituberculate molars in the posterior portion of its jaws, therefore the development of the teeth in this animal must be doubly interesting, especially with regard to the origin of the molars generally. I examined the heads and jaws of both young and adult animals. Unfortunately, I was unable to procure embryos of the chameleon. All the material was sectionized into series of twenty-μ thickness, and doubly stained with alum carmine and bleu de Lyons. The figures have been drawn with Oberhäuser's camera. Fig. 13 shows

Fig. 13.



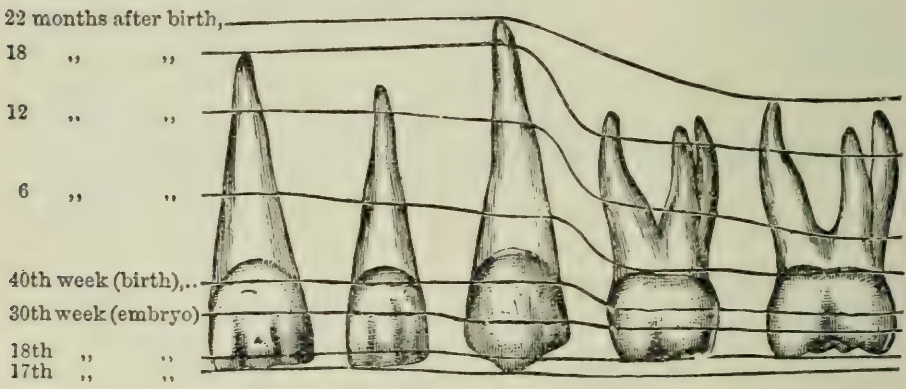
the teeth of the upper jaw five times magnified. The anterior teeth are unituberculate, the posterior ones bi- or trituberculate. All teeth are fused to the edge of the maxilla. *There is no shedding of the teeth in the chameleon*, nor could I prove it to take place in hatteria; but still there is, especially in the upper jaw, behind the functional teeth, a well-developed dental or reserve ridge. On its posterior end there takes place, throughout life, a continuous new formation of teeth. Accordingly, older animals have always a larger number of teeth than young ones. Although I examined macroscopically, with a lens, a number of heads of the chameleon, and microscopically six different series of sectionized jaws, I never succeeded in finding any indications of reserve teeth."

[1] Dental Cosmos, October, 1893.

To alienists, biologists, criminal anthropologists, and sociologists the human jaw and teeth are of peculiar interest, since their study establishes many points in evolution and environment not clearly determinable in other structures. Their study enables the observer without much difficulty to determine inherited and acquired stigmata. For this purpose the teeth should be studied from the first evidence of their development until they are all in place, which occurs normally in most cases by the twenty-second year.

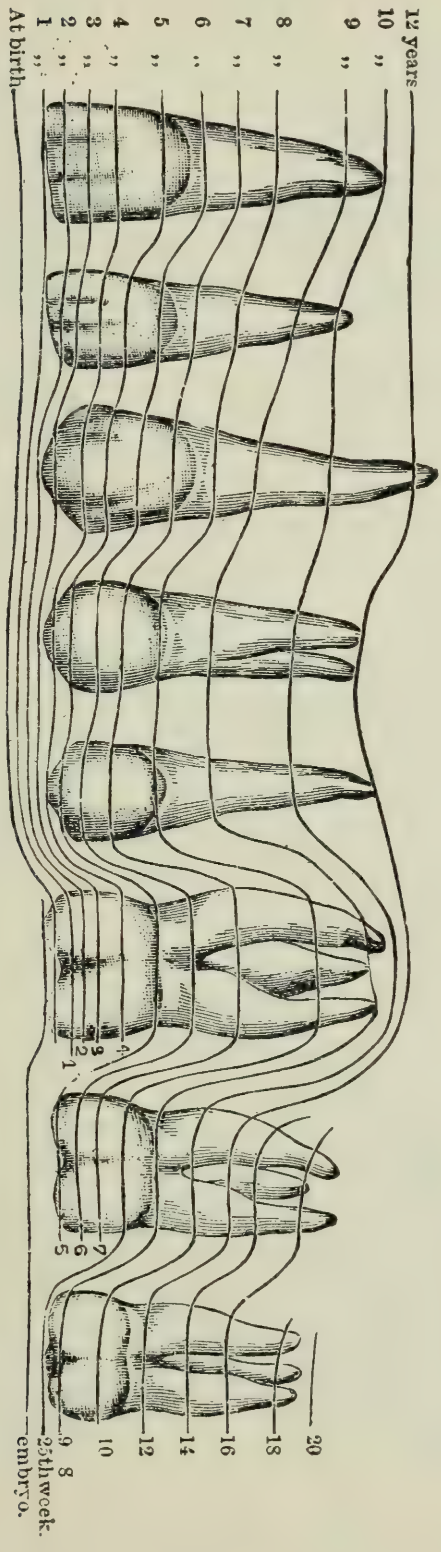
Enamel of the teeth is formed from the epiblast, and dentine, cementum, and pulp (except as to nerve-tissue) from the mesoblast. The enamel organs of the first set form during the seventh week of fœtal life, the dentine bulb during the ninth week. At this period the tooth obtains its shape and size, and calcification begins at its periphery. This models the enamel cap, which fits over the dentine like a glove. When imperfections in hand or fingers exist these deformities are distinctly observed upon the glove. In precisely the same manner are observed the different shapes and sizes of the incisors, cuspids, and molars. Calcification of the teeth begins at the seventeenth week of fœtal life. Illustration (Fig. 14)

FIG. 14.



shows the progress of calcification and development of the temporary set of teeth. Examination will show that any defect in nutrition from conception to birth (due to inherited states or maternal impressions) has been registered upon the teeth. The state of the constitution and the locality registers the date of such defects. Thus, if the tooth as a whole be larger or smaller than normal, or abnormally irregular, taint is undoubtedly inherited from one or both parents. If, on the other hand, there be defect at any part on the crowns of the teeth, and the contour be perfect, the date of malnutrition can be easily determined by consulting this chart. More or less than the normal number of teeth abnormally placed

Fig. 15.


12 years
10 ,,
9 ,,
8 ,,
7 ,,
6 ,,
5 ,,
4 ,,
3 ,,
2 ,,
1 ,,
At birth
20
18
16
14
12
10
9 8
25th week.
embryo.

demonstrate the existence of inherited defect, since the germs must have been deposited at the periods mentioned. No absolute

Fig. 16.

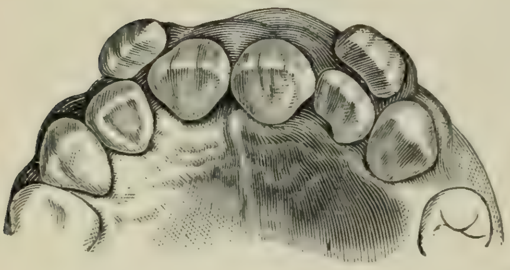
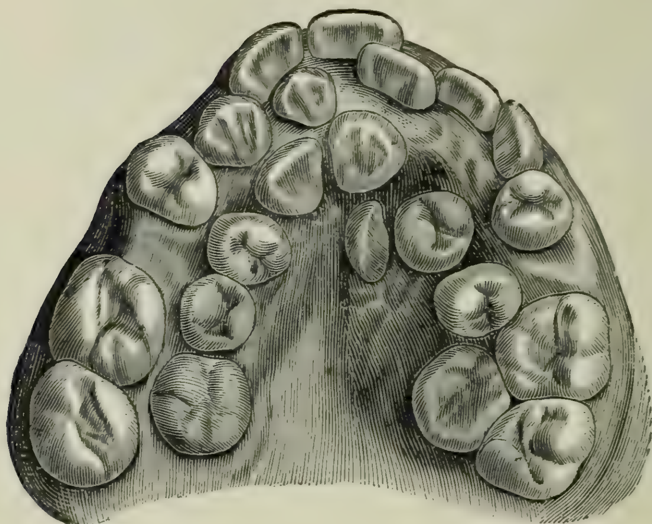


Fig. 17.

Fig. 18.

Fig. 19.

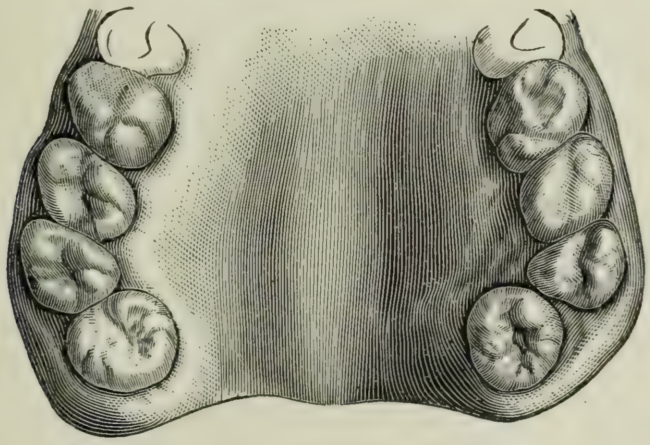


rule can be laid down as to the date of the eruption of the teeth. The teeth of the temporary set erupt nearly as follows:

	After Birth.	Time of Eruption.
Lower central incisors	7 months.	1 to 10 weeks.
Upper central incisors	9 months.	4 to 6 weeks.
Upper and lower lateral	12 months.	4 to 6 weeks.
First molars	14 months.	1 to 2 months.
Cuspids	18 months.	2 to 3 months.
Second molars	26 months.	3 to 5 months.

The enamel organs and dentine bulb for the permanent teeth form just before birth (Fig. 15) in like manner with the temporary set. They form just above the temporary set on the upper and below on the lower jaw. The permanent molars begin to calcify at the twenty-fifth week of fœtal life. The permanent incisors do not calcify until a year after birth. Any deviation in size or contour of the permanent teeth from the normal must hence be due to defect in nutrition in the dentine bulb between the fifteenth and twenty-fifth week of fœtal life. Any deviation in calcification (ex-

Fig. 20.



cept the cusps of the first permanent molars) must occur after birth. At the third year twenty-four teeth are fairly well calcified. At the fifth year the second permanent molars and at the eighth year the third molars or wisdom teeth begin to calcify.

The following table gives the age of eruption of permanent teeth:

First permanent molars	Circa 6 years.
Upper and lower central incisors	Circa 7 years.
Upper and lower lateral	Circa 8 years.
First bicuspids	Circa 9 years.
Second bicuspids	Circa 10 years.
Cuspids	Circa 11 years.
Second permanent molars	Circa 12 years.
Third permanent molars	Circa 17 to 24 years.

Man at his present stage of evolution has twenty teeth in his temporary and thirty-two in his permanent set. Any deviation in number is the result of embryonic change occurring between the sixth and fifteenth week for the temporary teeth and the fifteenth week and birth for the permanent. The germs of teeth which erupt late in life and are (properly) called third sets, of necessity appear ere birth, and are completely formed at the beginning of the second year, although they remain protected in the jaw until late in life.

More than twenty teeth in the temporary or than thirty-two in the permanent is hence an atavistic abnormality.

From a maxillary and dental stand-point man reached his highest development when his well-developed jaws held twenty temporary and thirty-two permanent teeth. Decrease in the numbers meant, from the dental stand-point, degeneracy, albeit it might mark advance in the man's evolution as a complete being. Marsh[1] points out that in the New Mexican lower eocene occur a few representatives of the lowest primates, such as the lemurarius and limnotherium, each the type of a distinct family. The lemurarius, most nearly allied to the lemurs, is the most generalized primate yet found. It had forty-four teeth in continuous series above and below. The limnotherium, while related to the lemurs, had some affinities with the American marmosets. Dr. A. H. Thompson,[2] in discussing the "missing teeth" of man, remarks that these researches of Marsh suggested and subsequent studies aided the solution of the problem of the origin of the extra teeth (known as supernumeraries) that sometimes occur in man. These, usually regarded as pure freaks, like polydactylism, are, however, beautiful illustrations of atavism, and demonstrate that man during his evolution from the lowest primate has lost twelve teeth. These supernumerary teeth assume two forms,—either they resemble the adjoining teeth or are cone-shaped. While they rarely are exactly counterparts, every tooth can be and is duplicated, as the following illustrations show. Fig. 16 illustrates fairly well-formed duplicate central incisors, the normal incisors being outside the dental arch. They are crowded laterally by the large roots of the supernumerary incisors. Fig. 17 shows an extra right lateral in a temporary set in the upper jaw; Fig. 18, an extra right lateral in the permanent set. Fig. 19 illustrates normally developed supernumerary cuspids, which are all

[1] Vertebrate Life, in American Association for Advancement of Science, 1877.

[2] Dental Cosmos, 1894.

grouped together upon the right side, the bicuspids being also duplicated on each side; indeed, all but the molars are duplicated. Fig. 20 shows supernumerary third molars easily demarcated from the normal molars. The teeth, which fail to approximate their normal neighbors, assume the cone shape of the primitive tooth.

The fact that the cone-shaped tooth, as a rule, is perfect in construction, is found everywhere in the jaw, but especially in the anterior and posterior part of the mouth, is of much value in outlining tooth and jaw evolution, especially from degeneracy aspects. The upper jaw, being an integral part of the skull and fixed, is of necessity influenced by brain and skull growth, hence degeneracy is more detectable in it than in the lower.

The evolution of the jaw is towards shortening in both directions. This shortening will continue so long as the jaw must be adjusted to a varying environment. The jaw of man having originally contained more teeth than at present, lack of adjustment to environment produces from the shortening degeneracy of the jaw and atavism of the teeth. While this may coincide with general advances of the individual, it indicates that he is not yet adjusted to his new environment. The shortening of the upper jaw causes supernumerary cone-shaped teeth to erupt in mass at the extreme ends of the jaw, as shown in the following figures. Fig. 21 illustrates a cone-shaped tooth between the two central incisors, forcing them out of position. Fig. 22 shows three supernumerary teeth; a cone-shaped tooth between the central, lateral, and cuspids out of position. The left permanent lateral is at the median line, another cone-shaped tooth remains in the vault, while the supernumerary left lateral is in place. As many as eight are at times to be observed in the anterior vault. Posteriorly these teeth are most often noticed in connection with third molars, usually on a line with other teeth, posterior to the last molar. Fig. 23 shows two supernumerary cuspids in the anterior and two in the posterior part of the left arch; the molars have been extracted. Supernumerary teeth are not confined to these localities, but may be observed at any point in the dental arch. (Figs. 24 and 25.) The primitive cone-shaped tooth is rarely observed in the lower jaw. In twenty-six years' practice I have not seen a case. The mobility of the lower jaw prevents that maladjustment to environment present in the upper.

The continual shortening in both directions of the jaw causes the third molars frequently so to wedge in between the angle of the jaw and the second molar that eruption, if possible, is difficult.

Fig. 21.

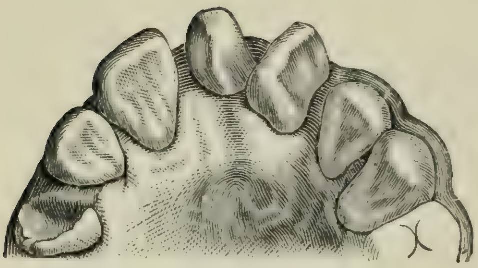


Fig. 22.

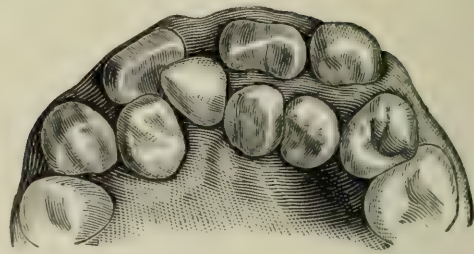


Fig. 23.

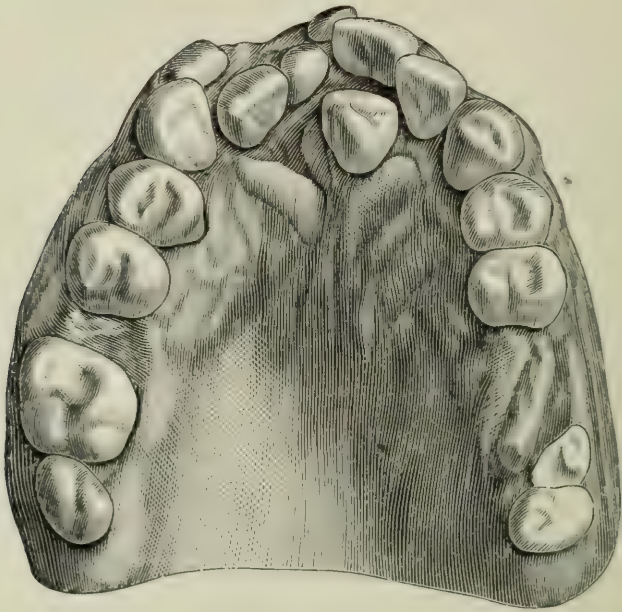


Fig. 24.

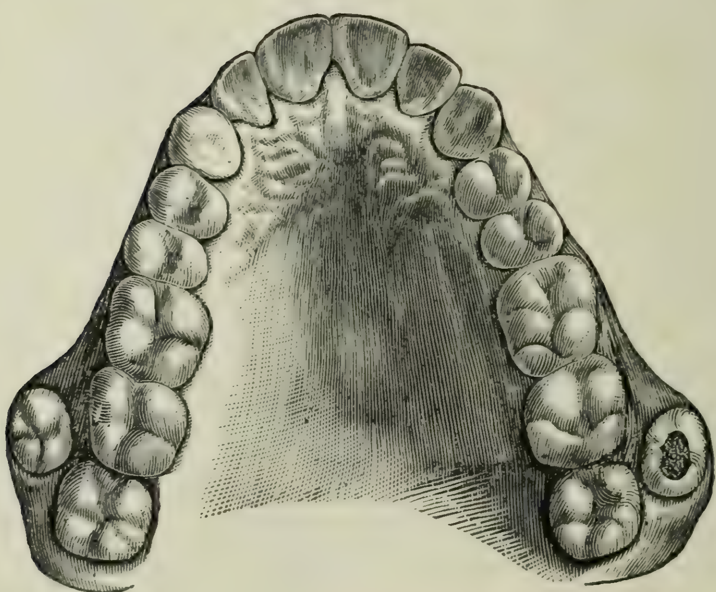


Fig. 25.

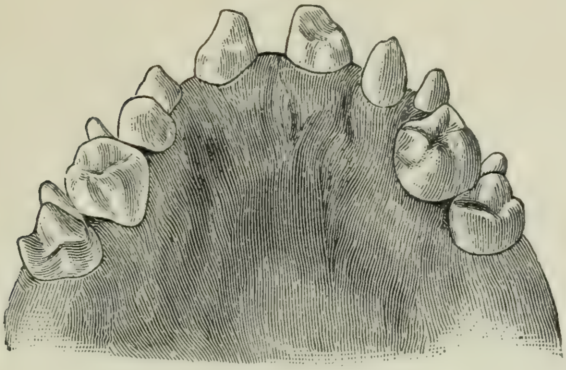


Fig. 26.

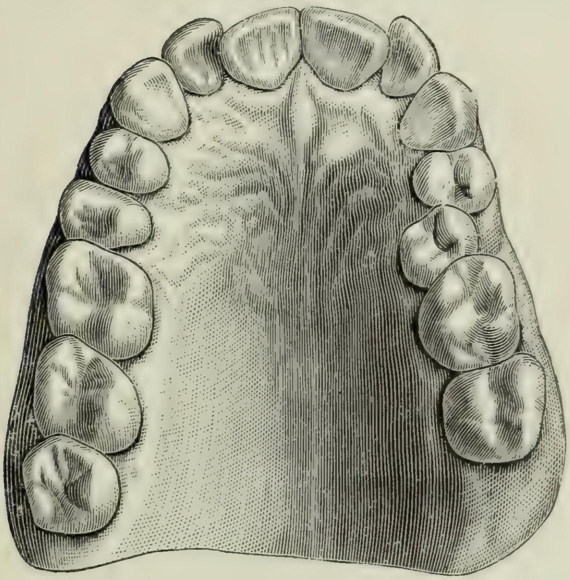


Fig. 27.

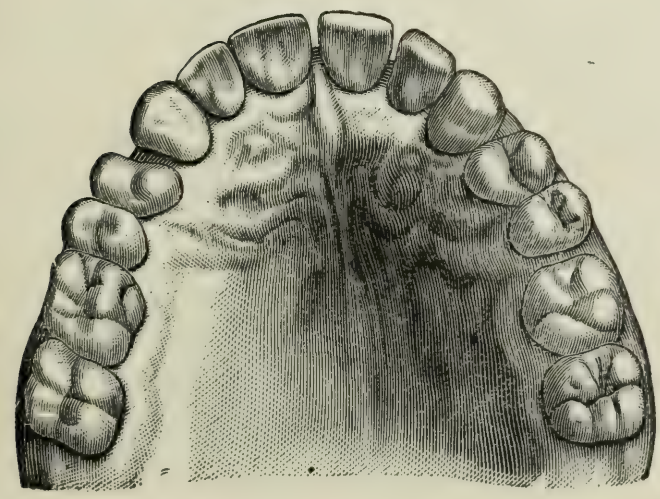


FIG. 28.

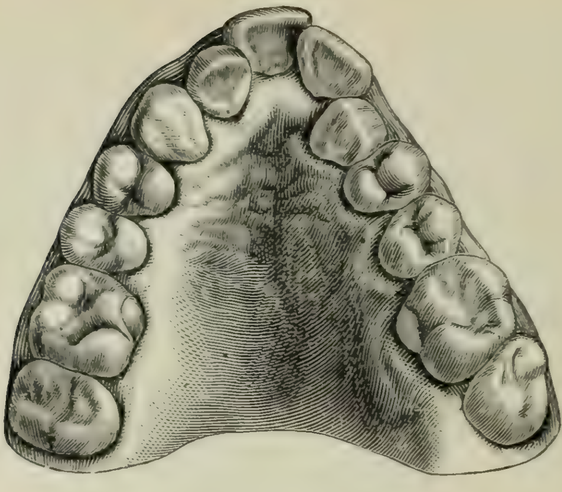


FIG. 29.

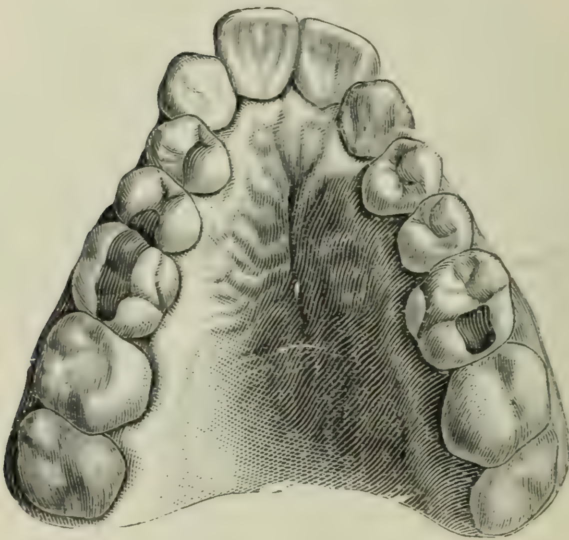
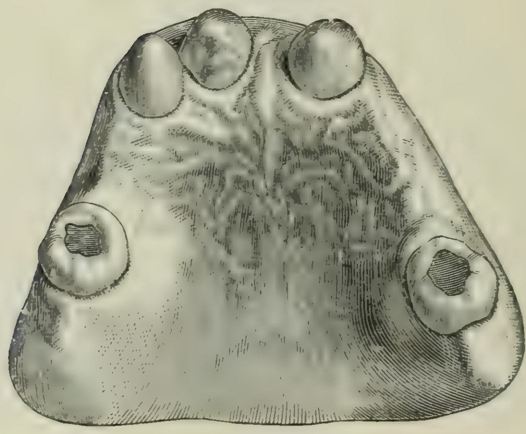


FIG. 30.



The third molar is often absent in the Caucasian races. In forty-six per cent. of six hundred and seventy patients it was missing. Frequently its development is abortive. This tooth in the struggle for existence seems destined to disappear. It is more often absent from the upper than the lower jaw. When absent or badly developed the jaw is smaller, and frequently teeth irregularities, nasal stenosis, nasal bone and mucous membrane hypertrophy, adenoids, and eye disorders coexist. Fig. 26 shows absence of the left third molar, with irregularities of that side of the arch. In Fig. 27 both third molars are seen to be missing, coincident with irregularities on both sides of the arch. Anteriorly the lateral incisors are most often wanting; fourteen per cent. of the laterals were wanting in six hundred and seventy patients. In the progress of evolution man has lost one lateral upon each side of the mouth, and the second lateral seems also destined to disappear. In Fig. 28 the left lateral incisor has disappeared, and in Fig. 29 both lateral incisors are absent. Not infrequently does it occur that centrals, cuspids, bicuspids, and even molars are absent; even their germs are not detectable. Fig. 30 illustrates a cast showing three supernumeraries in the anterior part of the mouth and but two molars. The absence of teeth indicates lack of development of germs, due either to heredity or defective maternal nutrition of the line of conception or during early pregnancy.

(To be continued.)

SOME THOUGHTS ON THE CARE AND MANAGEMENT OF THE DECIDUOUS TEETH.[1]

BY S. H. GUILFORD, D.D.S., PH.D.

Mr. President and Fellow-Members,—Wordsworth has beautifully said in his poetic way, "The child is father to the man." If this be true, and it doubtless is, that the character, temperament, and possibilities of the future man are shadowed forth in the earlier years of child-life, and that conversely the tendencies and proclivities, as well as the training, of childhood will affect and determine the character of the future man, may we not justly

[1] Read before the Academy of Stomatology, Philadelphia, December 22, 1896.

conclude that in a more material way the physical condition of the child will, to a great extent, determine the well-being of the man?

Weakly children do not usually develop into strong adults, nor vigorous children into delicate men. Of the various organs upon whose normal functional activities the health of the adult depends, none, perhaps, are more important than the organs of mastication, which guard the entrance to one of the most important of all organs,—the stomach.

In health the importance of the teeth is not apt to be fully appreciated, but in their absence or with their activities impaired, the resultant ills not only emphasize their usefulness, but often do it in a painful and health-destroying way.

The health of the individual, however, so far as the teeth are responsible, is not alone dependent upon or influenced by those of the permanent set, for the deciduous teeth play an earlier and most important part in determining the future well-being of the individual.

With mastication imperfectly or indifferently performed in childhood, the stomach often becomes so weakened in functional power by over-taxation as to never fully recover its normal condition. So, also, the suffering that the child is subjected to through decayed and tender dental organs will often produce a permanently deleterious effect upon the delicate nervous organism, and modify, if not entirely change, the natural disposition of the individual.

Less serious, though perhaps scarcely less important, is the humanitarian side of the question, which leads us to regard the comfort of the child as well as its health.

In view of these facts, the care and preservation of the deciduous teeth become an all-important matter to the child and a subject worthy of most careful consideration on the part of ourselves as practitioners.

As to the care of these organs, two essential points present themselves: one is that of instructing the parent how to properly brush and cleanse them, and the other that of impressing the importance of regular periodical visits of the child to the dentist for the examination of the teeth and receiving advice concerning them.

The cleansing of the teeth of young children should be done with a small and soft brush, and performed twice daily, morning and evening, by the mother or nurse. It should be done regularly,

carefully, and conscientiously; and while the child may not understand the object of it, a habit will gradually be formed which will lead to its continuance in after-years.

The visits to the dentist should not be less frequent than four times a year, upon which occasions most careful examinations should be made for caries, all discoloration or stain removed, and the indications of the eruption of the permanent teeth watched for.

These regular visits, unattended by pain, discomfort, or fatigue, will not only accustom the child to the surroundings of the dental office and forestall any natural dread, but they will lead to the establishment of relations of intimacy and confidence between the practitioner and his little patient, which will make future and less agreeable operations more easy of accomplishment.

When incipient decay is noted, either upon the exposed or approximal surfaces of the teeth, it must at once be removed, and when minute cavities are discovered they will have to be filled. The frequent visits will lead to the early discovery of decay and its easy remedy.

So, too, when the time arrives for the shedding of the teeth, the practitioner can notice their gradual loosening and at the proper time remove them.

With the confidence of the child once secured, the extraction of a loose deciduous tooth can easily be accomplished.

In this way, by means of the regular visits of the patient and the careful scrutiny and faithful service of the practitioner, the child, if of average health, should be enabled to pass through the period of early childhood without suffering or discomfort, and reach the time of youth with the dental organs in the best possible condition.

Unfortunately for us, however, and for our patients as well, no such Utopian conditions exist, and we have to accept things as they are and not as we would have them. Whilst we can see the little members of our regular families periodically, and carry along their dental organs in the easy and comfortable manner just outlined, in too many cases they are only presented at long and irregular intervals, after caries has made serious inroads and the organs are more or less permanently injured.

This makes our task more difficult and involves a more trying ordeal for the patient.

The one operation most frequently called for in the deciduous as well as the permanent teeth is filling, and the question at once

arises as to how we may perform the operation with the minimum of pain and discomfort and the maximum of usefulness.

Owing to existing conditions the procedure must vary considerably from that followed in operating upon the permanent teeth, both in regard to details and the character of materials employed.

Gold, the mainstay of the operator for the permanent teeth, is virtually interdicted for the deciduous ones, on account of the difficulties of its introduction, and we are, therefore, forced to depend upon materials of a plastic nature. Fortunately, however, these materials, though of such limited durability, can, in the hands of the skilful, be made to serve the necessary purposes during the comparatively short period that these organs remain in active service.

Of the plastics most commonly used, zinc phosphate is the least valuable, on account of its slight durability and the danger of pulp devitalization, which usually attends its employment.

Being easy of preparation and introduction, its use is far too common, although occasionally it serves a valuable purpose in large cavities with frail walls, where other materials would be most difficult of introduction and retention.

Amalgam is not a sightly substance when placed in contrast with fair tooth substance, but its durability, together with its rapid and easy introduction, renders it of greatest service to us in the posterior teeth, where its inharmony of color will not be apparent, but its employment in the anterior teeth is uncalled for and totally unjustifiable.

For the incisors and cuspids we have in gutta-percha a material without a peer. Although more difficult of introduction than the other plastics referred to, it is far more durable than zinc phosphate, is non-irritant, non-conductive, and easily repaired or added to.

For many years your essayist has made it an almost invariable rule to employ amalgam for the posterior deciduous teeth and gutta-percha for the anterior teeth.

Complications are frequently encountered, however, in our endeavors to save these teeth that tax our skill and ingenuity to the utmost. After excavation the pulp is often found to be nearly or quite exposed, and in other instances it has become devitalized and abscess has supervened. How to treat these conditions to the best advantage of the patient often presents a serious problem.

If it be important to preserve the vitality of a pulp in the per-

manent teeth, as most of us will agree, it is even more so in the deciduous set; for while in the one case it is no difficult matter to devitalize and remove a pulp and successfully treat and fill the root-canal, in the deciduous teeth the operation is beset with many difficulties and the after good results are not by any means as certain.

Besides this, we must remember that while a healthy devitalized permanent tooth will be serviceable and not interfere with nature's processes, a deciduous tooth similarly conditioned often materially obstructs the physiological changes incident to second dentition, for in most cases after the death of the pulp the normal resorption of the root ceases. This might prove of minor importance were it not that the condition seriously impedes the eruption of the permanent successor, often causing it to erupt out of its normal position and producing irregularity.

With these facts in mind, it behooves us to employ our best skill to preserve the life of the pulp in every case where it is possible. This can in most instances be done by the usual method of capping, and while the operation is attended with difficulties not met with to the same degree in the permanent teeth, it is always worthy of our best efforts.

Where the devitalization of the pulp is unavoidable, it should afterwards be removed with the greatest care and the root-canal treated antiseptically and filled.

In my own practice I obtain very satisfactory results by packing the canal as tightly as possible with cotton and iodoform paste. The method pursued by some, of allowing the dead pulp to remain and then drilling a vent below the gum line for the escape of the gaseous products of decomposition, is unscientific in character and disgusting in results; whereas the other practice of removing the pulp and leaving the canal unfilled is simply to invite future trouble, with small chance of being disappointed.

In the treatment of abscess at the roots of the deciduous teeth we meet with our greatest difficulty, on account of the tender years of the patient, the large apical foramen, and the uncertainty of the result. However, if the patient be tractable, it is best to put forth the effort to cure, and, if unsuccessful, we have at least the last resort of filling the root antiseptically, and thus lessening, if not remedying, the disease. Where the tooth thus affected is approaching the period of displacement and the condition is not attended with discomfort, we may be justified in non-interference.

In extreme cases of suffering, where relief cannot be obtained

in any other way, extraction may be resorted to; but it should in all cases be a last resort, for the removal of any of the deciduous teeth before the proper time will frequently lay the foundation of irregularity in the permanent set.

One point remains to be touched upon, and that is the form in which the approximal surfaces should be left after filling. A few practitioners believe that the contour should be restored as in the permanent teeth and for the same reasons; whereas others, and the majority, practise permanent separation, for the reason that it simplifies the operation and is likely to work no harm in the short time that these teeth are retained.

I believe the latter plan the wiser and better one, all things considered, but in either case it appears reasonable that a permanent separation should be made between the deciduous second and the permanent first molar where the former has become decayed upon its distal surface. In almost all such cases the mesial surface of the permanent tooth is found to have been injured by caries, and its extension can best be checked by the prevention of subsequent contact.

ANNUAL ADDRESS.[1]

BY JAMES M'MANUS, D.D.S., HARTFORD, CONN.

At the annual meeting of the Connecticut Valley and the New England Dental Societies, held in Worcester, Mass., October 23, 24, and 25, 1895, each society, after mature deliberation, voted to disband and the members of both societies to again unite to form a new society. The pioneer missionary work done by these societies is in part on record in the dental journals, while memory alone will recall the many dear old friends and pleasant gatherings for thirty-three years past that will linger long in the hearts of the few that are left of the original members of the disbanded societies.

With best wishes for the continued success of the new organization, the money left in the hands of the treasurers of the old societies was passed over as a christening present to the young Northeastern Dental Association. We have said good-by to the old societies, and to-day the new one is given a hearty welcome,

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[1] Delivered before the Northeastern Dental Association, held at Springfield, Mass., October 21, 1896.

realizing, as we all must, that the new departure means, if anything, a broader and fuller recognition of the demands of the dental profession on each and every member in practice to-day in the New England States.

It has been said by several well-meaning men that dental societies are not now needed in these progressive days, and that under the dental laws, now in force in every State in the Union, the State society alone was the one to be built up and fostered. If dental laws are to be properly enforced, and they should be, the dental examiners should and must have the backing and moral support of the best men in the profession in each State. I have said the best men, for every practitioner has it in his power to be called one of the best men in his profession if he so wills it, and every young man especially should aim to gain such a record with his professional associates; but all young men and old should be enrolled as members of their State society and take an active interest in society work. They should strive to promote the welfare of their society, and their best judgment and influence should be exerted with the appointing power in their State to have only such men selected as dental examiners as are qualified both in head and heart to fill the responsible position acceptably to the profession and for the best interests of the public. The laws of the State and the society imply that care should be exercised in taking students, as it finally rests with the State examiners to grant or refuse a license to practise in many of the States; therefore only those that give promise of gifts and qualifications that would make competent dentists should be recommended to the different colleges for instruction and graduation.

Our plain duty, then, is first to build up our State societies, practically, theoretically, scientifically, and, what is of great, very great importance, socially, we need to know each other better than we do, for the social side of society gatherings brings out the best that is in us professionally. I have heard the remark made by some few men at society meetings, "that they did not learn anything at them." A very unfortunate admission for them to make, for if they did not hear or see anything of interest and value, it must have been because they were neither giving attention to the clinics nor listening to the papers that were read and the discussions that followed. How any man interested in a special line of work can fail to get new ideas and valuable suggestions while listening to a discussion by fellow-workers it is hard for me to conceive. If, before attending a dental meeting, we would recall the

old maxim "that it is better to give than to receive," and each one of us go prepared and willing to take a part in the discussions and talks on office practice, our meetings might be made even much more interesting and instructive than they have been in the past. The men that built up the old societies of the country were full of that spirit. They gave their time, money, and earnest work freely to help each other. They gave their experience and told of their failures. They demonstrated their way of operating, and exhibited their pet instruments and asked for the introduction of new and better ones. They spurred each other on to study and write papers for the society and for the journals, in this way interesting those outside of society membership. Those that were present at the meetings when Drs. Taft and Atkinson visited the New England societies, in 1863, by request of the American Dental Association, will remember the interest they awakened and the new life given to society work by their advice and counsel. To the good work done by the societies of this country in the past is due the high position that American dentistry has reached to-day in the estimation of the people of the civilized world. "Men may come and men may go," but ideal competent dentists are needed now and will be for all time. Education, study, and practice will not completely accomplish everything. There is always a need for broader knowledge, and that can best and most pleasantly be acquired by attending the post-graduate schools held by the State and national societies each year. We are now restricted as practitioners by State laws, but I do not think the intention was to build a Chinese wall, cutting us off from social and professional intercourse with our friends in other States. The frequent union meetings held in the past tell plainly that we all desire to see and hear men from other States, and all are benefited by attending these meetings.

The Southern and American Dental Associations have had under consideration for some time past the advisability of uniting to form one national delegated society. Other plans have been suggested for a new order of district organizations throughout the country. What may result from these different movements remains to be seen. The disbandment of the old societies last year and the formation of the Northeastern Dental Association, to include all New England dentists, marks the first forward movement for a higher development of society work in this country. To carry on the work successfully will require the co-operation of every society in this district. Mutual arrangements should be made to hold the annual society meetings in the months of April, May, and June, so

that all those who wish to visit the different State meetings can do so. Each State society should strive for a larger membership, and a more active interest must be taken by the individual members to make the meetings interesting and profitable, so that they will be anxiously and pleasantly looked forward to. Dental meetings properly conducted are in reality special schools for instruction, where one may get valuable advice as to the treatment of special cases, and technical instruction, both orally and through clinics, as to the various methods of operating under questionable conditions. Time should be set apart for relating incidents of office practice and for the practical talks that would follow, so that all may profit by hearing each other's experience. The young men should be encouraged to write papers and to take part in the discussions, for teachers and writers will be fully as much needed in the future as they have been in the past. That society meetings are the best training-schools to develop and bring to the front men that are best qualified to teach and write will be admitted by all who have watched the career of the successful writers and teachers of to-day.

There has been a great deal written and said about the great advance made by dentists and dentistry in the past fifty years. It is well to reflect and remember that all that has been gained must be credited to the self-sacrificing efforts of a very few earnest men, whose names you will all readily recall. We boast of the record of the past fifty years, forgetting the fact that it would be very difficult to give the names of fifty men (one for each year) worthy to be put on the roll of honor for advanced professional work, either as writers or teachers. When you recall the criticism that has been made so frequently of late years on the business management of the colleges, it would be well to remember what an immense professional debt we all owe to the men who have been connected with the colleges in the past and at the present time. Many of them have given years of earnest work as teachers, getting little, often no pay for their time. They have been on call in season and out of season to give lectures and talks at society meetings, without even being offered any compensation. A few among them have written exhaustive works on dentistry and others valuable text-books, while the current literature of dentistry has been mainly written by a few men who were more or less intimately connected with the colleges. These men should be honored now for the great work they have accomplished; they deserve and should be given the warmest thanks and support of the profession. The captious and often unjust criticism made by a few over the alleged misman-

agement of some colleges should be listened to as we would to a wind squall,—soon over and sooner forgotten; for if there have been faults of management in any of them, they will in due time be remedied. If the individual members of the profession will see to it that only good, earnest students are recommended to the colleges, there will be little or no trouble in the future regarding the management of them. Owing to the laws now in force in the different States, the public are led to believe that all the dentists now in practice are properly qualified; for the laws are stringent and the dental examiners are supposed to be capable and thorough in their examinations. All dentists before the law stand equal, and for this reason we believe that the future of dentistry depends on society membership and society work. What has been done for dentistry in the past (aside from mechanical inventions and appliances) by men outside of society membership? and what better test can be had in the future of a man's qualifications than his standing among his brother practitioners? There is need in the future for thorough and high class society work, and, fortunately, under the new order of civic laws, the way is made easier and less expensive than in the past. Our first duty is to attend and support our State society meeting in the spring at an expense of two dollars a year. The next outlay will be at the district meetings in the fall. It should be a pleasure to attend both these meetings, and there are none so poor but they can do so if they wish.

There is another duty that has been overlooked and neglected by too many in the profession, and it would seem as if their conscience would prick them when they read the reports in the journals of the meetings of the American Dental Association. While many may feel that they cannot attend the summer meetings of the Association regularly, they ought to have enough interest in it to help it along in its good work. It would startle even those most interested were they to recall even a part of the valuable work that has been done by the members of the Association, and which has been freely given out broadcast to the profession. There are many in this district that can easily afford to become permanent members of the Association, and they should willingly pay the yearly dues of five dollars to help the Association along in the work it has been doing since its organization. The amount of dues to the three associations is less than ten dollars a year, a very small part of the yearly income to pay out for the new ideas and valuable information we may get in return from attending these meetings, especially the American Dental Association, where we may have an opportu-

nity to meet and make new acquaintances and keep in touch with the prominent men in the profession from nearly all parts of the country. There has been no sectional feeling in the American Dental Association. The best efforts of its members have been exerted in a line of work that will benefit the profession of the world. The Association has been restricted in the past from lack of members and consequent lack of funds. If a goodly number of the men who have in years past attended the meetings as delegates had continued on as permanent members, the financial condition would have been such that much more of good might have been accomplished. There are said to be over twenty thousand dentists in the United States who are legally qualified to practise. They each and every one profess to be dentists, and yet it is a lamentable fact that of the entire number the total membership of the American Dental Association for the past two years has been less than two hundred and fifty members; and of this number cultured New England, under the most favorable circumstances and conditions, furnished only seventeen members. If only one in twenty of the dentists of the country could be induced to become permanent paying members of the Association, it would soon be in condition to co-operate in a satisfactory manner with the curator of the Army Medical Museum in Washington, D. C., who stands ready and anxious to help along the movement recently inaugurated by the American Dental Association, and to place in the rooms already set apart for the dental department everything of value that can be secured in the future in the way of books, specimens, and materials that will be of interest to the dental profession. It is time to attempt to arouse a more general interest in professional work and to start a dental revival, as there is a pressing need for missionary work to be done all over the country, and especially in certain districts, that can best be influenced by the workers in the State societies. The promoters of this Association, while loyal to their State organizations, are equally anxious and desirous that the State societies should join with them in their efforts to make the Northeastern Dental Association a successful post-graduate school. With the hearty co-operation of the dentists of this district, we may reasonably hope to benefit and to accomplish for the profession of New England all that it has been the aim of the American Dental Association to do in the past for the profession of the entire country.

ON "FIVE-MINUTE PAPERS."[1]

BY CHARLES M'MANUS, D.D.S.

When I was asked to join that forlorn hope, the minute—five-minute—men of dental meetings, I accepted at once, because I believe it to be a duty every member (particularly every young member) owes to any society to which he may have the honor to belong to help along the meetings and fill out the programmes to the best—or the worst—of his ability.

It was suggested that I undoubtedly could not have anything practical to say, but that I might ramble on about things in general and "short papers" in particular, and that I should be doing a service to the other speakers by affording a contrast.

I am rather fond of five-minute papers,—most people are,—because, in the first place, they are comparatively short, and when one begins, the audience and the speaker are able to feel a sense of relief in the thought that it will be all over in five minutes.

If one has some things of practical interest to bring before a meeting, it would seem as if these short papers and talks were just the place to introduce them. And if one has nothing at all to say, it will not take anything like five minutes to demonstrate the fact.

Lest I might be accused of being more presumptuous than I really am, I want to say right here that the little I have to offer is addressed to the very young men,—I wish there were more of them here,—the young men early in practice and just joining their local societies, the men from whose ranks will have to be recruited the dental societies of the twentieth century, and from among whom may be expected to come the reluctant essayists of the future.

It is not such an easy matter to get men to take an active part in a dental meeting. You will observe on your programme that not a single one of the four papers is written by a man on the membership roll of the Association. At a meeting of another society, out of one hundred members it was impossible to secure more than two men willing to read papers.

That this state of affairs is not confined to any particular locality will not be questioned by any one who has given the subject attention.

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[1] Read, with thirteen others, at the meeting of the Northeastern Dental Association, Springfield, Mass., Thursday, October 22, 1896.

I have no sympathy for the young man who says he cannot contribute a short paper, or talk to his local society meeting, because he has nothing of real interest to say. If we only opened our mouths when we had something of great value to put forth, what a very quiet world this would be—even during a Presidential campaign.

While a very modest young dentist might think it presuming to burst out with a real live dental essay about something he hopes might interest his fellow-practitioners, he ought to have no hesitation about joining the "five-minute men."

How often do we hear of some point in practice or method of procedure brought up at a meeting or published in a journal, and immediately men appear from all sides to say that they did the very same thing in 1870 or 1860 or 1850, as the case may be, but that they did not happen to think to say much about it.

The place to bring forward these little points and "get a record" is in the "five-minute" paper.

One should never hesitate about reading a short paper because he is afraid it might be criticised harshly; he is fortunate if it be discussed at all.

To have a paper really discussed, criticised, pulled to pieces, and fought over would be a great compliment to any young man. The usual fate of the ordinary dental essay is to have it fall to the floor with a dull, cold thud.

A well-known writer in the course of a recent article says,—

"The usefulness of the older-fashioned State societies is passing away, and this decline is due to the decline of the old-fashioned essay and clinic. The rambling essay of the amateur writer of former days is giving way to the highly wrought monograph of the specialist."

I think that if one had time to go over the old files of the dental magazines closely he would find that "the amateur writer of former days" and the "highly-wrought specialist" of to-day are, in many cases, one and the same person.

It is simply a case of evolution, for, like Topsy, they have "growed." Many of the more gifted writers in dental literature to-day began with very modest efforts, and I am sure that that is likely to remain a condition until men are born dental specialists and not infants.

As a bit of mental discipline it would be an excellent idea for the young dentists to form a habit of writing up (in their moments of enforced leisure) any cases of interest that may occur in their

practice, not simply with the chastened hieroglyphics of the case-book, but with an eye towards a slight literary style and finish and scientific edge strength. Not necessarily for publication either, but as an evidence of good faith and interest in their profession outside the bread-and-butter aspect.

In fact, I should think that some such beginning would be a sort of literary "school of technics" for young dentists that might in the future blossom forth and bear fruit on the announcement programmes of their societies.

And so my earnest advice to the young dentist is, join the patriotic ranks of the "five-minute men." Begin there, and the day may come when you too can produce "the highly-wrought monograph of the specialist," which often, like "Mercutio's soul, is but a *little way* above our heads."

A NON-TOXIC LOCAL ANÆSTHETIC.

BY W. H. JONES, D.D.S., FULTONVILLE, N. Y.

Even the most conservative practitioner finds a non-toxic and effective local anæsthetic a grateful addition to the dental armamentarium. The greater number of our patients have often heard of having a tooth extracted painlessly, and as there are always occasions when a tooth has reached a condition where it is better out of the mouth than in it, so, when extraction becomes a necessity, the operator will be asked the question, Can you not put something on the gums to alleviate the pain?

The hypodermic injection of eucaine, combined as follows, will give a satisfactory and painless extraction, and the nervous and excited patient will never again postpone a necessary extraction, but will endure the next operation, should one be necessary, with unruffled nerves:

	Grammes.
Eucaine hydrochlorate	0.8
Hamamelis Virginiana	7.8
Glycerole	1.6
Hydronaphthol sol.	0.129
Guaiacol	0.129
Strophanthin	0.013
Aquæ dest.	19.5
Saccharin ad grat.	

The above formula has been used with unusual success for the past six months. There are many cases in which the operator does not care to administer nitrous oxide or ether, but owing to the nervous and sometimes debilitated condition does not wish to operate without alleviating the pain in some manner. A local anæsthetic is a useful friend in this extremity.

The point of puncture can be anæsthetized by touching the mucosa with a solution of trichloracetic acid, glycerol, and cocaine in the following proportions:

	Grammes.
Trichloracetic acid	1.296
Glycerol	1.944
Cocaine	1.620

If the gums are healthy, they are not very sensitive, and the puncture may be made by making a firm pressure with the index-finger of the left hand and placing the needle at the edge of the point of pressure. Disinfect the mucosa before proceeding to operate.

NITRATE OF SILVER IN ROOT-CANALS.

BY CHARLES D. CHENEY, HOBOKEN, N. J.

THE publication in your November issue of a paper upon a nitrate of silver method of root-canal treatment decides me to give my own experience in the same direction.

I would state that I have been experimenting (if a steady reliance may be so designated) with silver nitrate for over two years. I have used it in root-canals during about that period, and have come to believe that in it we have as near an ideal as we are likely to get.

I have not before this publication seen or heard silver nitrate suggested for root-canal treatment; it was, however, but a short step for me from the use of it in an ordinary cavity of decay to use in the canals. I have used it with satisfaction in ordinary cavities for a number of years, and during the period of *canal* use my satisfaction has been infinitely increased.

I may say I consider pulp-extirpation and canal-filling more scientific than any method of so-called pulp-"capping," especially since silver nitrate makes the former operation practically successful and certain.

I have never seen any objectionable effects from its use in nerve-canals, or I believe I may say *any* "effects." The use of the nitrate when the pulp is but thinly protected by dentine is not to be tolerated, but I have not observed any irritation to the pericementum when the canal may have been large and the walls thin.

An important improvement which I very early discovered and have used exclusively since was the substitution of an alcoholic saturated solution of silver nitrate for the customary aqueous solution. This is an improvement which I consider essential to thorough success. Alcohol dissolves less of the nitrate, but the rapid evaporation compensates and makes a less quantity equally efficacious; the alcohol also penetrates farther and quicker than water; a warm-air blast or even a few moments' delay and the natural body heat gets rid of the solvent, and also any small degree of moisture which may be present, thus leaving a deposit of microscopic nitrate crystals to continue the effect very slowly as the natural moisture returns to the immediate vicinity.

Rather strange, it seems, but there appears to be within the canals none of the usual discoloration of silver nitrate, except in the presence of organic decomposition, when the precipitation of black oxide or sulphide is instantaneous. Decayed dentine is not so affected, though it often becomes slightly yellowed.

The silver nitrate seems to take such thorough care of affairs within the canal that it would seem less important what filling is used, provided it be non-absorbent and unchangeable. I have good success with gutta-percha, avoiding most religiously, however, all that which has any considerable "toughness,"—that is, a quality which is incompatible with its successful use in any way.

The painting of the surrounding gum with strong tincture of iodine, immediately after the filling, contributes in a large degree towards success and the comfort of the tooth, as I believe.

Occasionally the slight soreness due to the operation may persist over twenty-four hours, in which case I repeat the application of iodine or advise capsicum plasters, according to circumstances.

Abstracts and Translations.

SILVER AND ITS SALTS AS SURGICAL ANTISEPTICS.[1]

BY DR. B. CREDÉ.[2]

Dr. B. Credé, in an address delivered before the National Surgical Society of Germany at its Twenty-fifth Annual Convention, held at Berlin on May 28, 1896, discusses silver and its salts—more especially citrate and lactate, which are termed in Germany itrol and actol respectively—as the surgical antiseptics of the future. We present an abstract of his address:

Dr. Credé begins by remarking on the impossibility of treating the entire subject with any degree of exhaustiveness within the necessary limits of his paper, and referring those who desire more detailed information concerning it to his treatise on "Silver and Silver Salts as Antiseptics," published by F. G. W. Vogel, of Leipsic. The observations of his father, made years ago, on the value of the nitrate of silver in the treatment of the inflammatory affections of the eyelids in infants, had led him to make a general inquiry into the therapeutic application and usefulness of silver and its salts. He found, however, that so far as wounds were concerned, he had no success with the nitric acid salt of the metal, on account of its chemical instability and its corrosive action on the mucous membranes. Nor did his trials with the argentic albuminoids, more especially with argonine, give any better results. While visiting the Johns Hopkins Hospital, in Baltimore, however, he was struck with the good results obtained by Dr. Halsted by the use of silver foil as an antiseptic covering for small or closed wounds.

In a subsequent series of experiments made with his assistant, Dr. Beier, Credé proved that metallic silver, when placed upon aseptic sterile wounds, is non-irritating and remains unchanged, forming a thoroughly aseptic dressing. On the other hand, it appeared that when a wound or any part of it was infected, the

[1] Abstract of an address delivered before the National Surgical Society of Germany at its Twenty-fifth Annual Convention, held at Berlin on May 28, 1896.

[2] Royal Councillor and Chief Surgeon to the Carola Hospital of Dresden.

products of bacterial vitality oxidized the surface of the silver, and, entering into combinations with the argentic oxide, formed argentic albuminates which had powerful antiseptic properties. Credé and Beier succeeded in determining that it was the organic acids, and especially lactic acid, formed in the microbic secretions, that united with the silver oxide, and they proved that an infected wound, when dressed with metallic silver, generated an antiseptic "lactate of silver." At Credé's suggestion the Chemische Fabrik von Heyden, at Radebeul, near Dresden, prepared a pure and absolutely stable lactate of silver.

Lactate of silver is a white, odorless, almost tasteless powder, permanent if kept in a brown glass vial, and soluble in fifteen parts of water and albuminous fluids. It has no irritating or corrosive action upon wounds, though in sensitive cases it caused more or less burning. In 1 : 1000 watery solution it destroyed streptococci, staphylococci, and the anthrax bacillus within five minutes. In blood-serum it retarded the development of bacterial germs in a dilution of 1 : 80,000; whilst corrosive sublimate does so only in a strength of 1 : 20,000. The destructive action of the silver salt on bacterial life is, therefore, four times as great as that of corrosive sublimate, as has been already noticed by Koch and Behring. And not only is corrosive sublimate far more poisonous than the silver salts, but it has the great disadvantage of forming insoluble compounds with albuminous substances when applied in concentrated solution, whereby it destroys the cellular tissue and a further penetrating antiseptic action is prevented. Whilst the silver salts prevent the growth of the bacteria, they do not destroy the cellular tissue; they remain in solution, and the solution permeates the tissues layer by layer. The lactate of silver being absolutely non-poisonous, and both it and its albuminates remaining soluble, may be used hypodermically in the infectious diseases. Credé treated two hopeless cases of anthrax and five grave cases of erysipelas by the subcutaneous injection of a solution of lactate of silver. He used .5 : 20 ($\frac{3}{4}$ grain to 5 drachms) of water for the anthrax and .3 to 1 : 100 to 200 (5 to 15 grains to $3\frac{1}{3}$ to $6\frac{2}{3}$ ounces) of water for the erysipelas cases. All cases recovered. Encouraged by his success, he proposes to use this treatment in cases of septicæmia, pyæmia, puerperal fever, and diphtheria. The injection is somewhat painful and should be done under cocaine or general anæsthesia.

In veterinary practice a solution five times as strong may be employed.

Eight other organic silver salts were prepared by the Chemische Fabrik von Heyden for Dr. Credé in the attempt to obviate the irritant effect that the lactate of silver shows when employed in powder form, on account of its ready solubility. It was thought that on account of their close chemical relations to that salt they would have similar antiseptic properties, whilst being less readily soluble there would be less possibility of any toxic effect when freely used for long periods. Clinical and bacteriological experimentation both showed that the citrate of silver was the most efficient form of the metal.

Citrate of silver is a light, dusty, and stable powder, without odor and almost devoid of taste. It has the same antiseptic power as the lactate, but it requires three thousand eight hundred parts of water for solution. A watery solution of 1 : 4000 destroys all bacteria within ten minutes. It occasions no unpleasant or painful sensation at all in any wound, and its scanty solubility causes it to last longer and enables it to be employed in smaller quantities. It is, therefore, cheaper to use than iodoform, though its price is more than twice as great.

Credé has now used the citrate of silver for more than seven months, and has treated with it over four hundred surgical cases and over one thousand patients in private and clinical practice. He has never observed any abnormal or detrimental action; on the contrary, there has been a normal and rapid process of healing never before experienced with the former methods of asepsis and antisepsis.

Credé then proceeds to detail his method of treating wounds. Whilst recognizing the desirability and value of an aseptic course of treatment, he rightly claims that the antiseptic one cannot be dispensed with, since many wounds come to the surgeon already infected, others are so situated that aseptic treatment is impossible, and a perfect aseptic treatment is only possible in a well-appointed hospital, not being practical in private practice, and still less on the battle-field. He has frequently observed in parallel cases that the process of healing was much more rapid with his antiseptic method than with the ordinary aseptic one, besides being less expensive on account of the relatively small amounts of material used. Chemical disinfectants are, it is true, going more and more out of use, probably because no universally applicable antiseptic is yet known. There is no one that is entirely devoid of irritating action, that is non-poisonous, that does not affect the cellular tissue unfavorably, that is odorless, that can be used as a powder

and at the same time never fails to destroy the germs. He does not maintain that citrate of silver is such an ideal antiseptic; but he does claim that we have as yet no better and no more perfect one at our command.

Credé's method of wound treatment stands about half-way between the aseptic and the antiseptic processes. After operation the wound and its surroundings are carefully and repeatedly rinsed with water. When the wound is closed it is first covered with silver gauze or with the "gray silver dressing," so called to distinguish it from the "white silver dressing employed in minor wounds and transplantations. It is a mull impregnated with metallic silver in a most minutely-powdered form; it is perfectly non-irritating, and forms undoubtedly a superior aseptic dressing. Its antiseptic action is initiated after bacterial infection of the wound and development of the lactic and other organic acids, forming the powerful antiseptic, the lactate of silver. It forms a constant and prompt counteractant to any secondary infection.

Wounds that are not to be closed at once are first dusted with the citrate of silver and then covered with the silver gauze. Glean wounds and complicated fractures are thoroughly cleansed with soap and water and liberally sprinkled with the dry citrate of silver, without disturbing the process of healing by a minuter examination; the cavity is then filled with the silver gauze and the whole covered with the common sterilized gauze. Even if the infection is already deep, a certain amount of disinfection can be accomplished in this way, for the citrate of silver remains dissolved in the serum, penetrates the cellular tissues, and reaches the point of infection. A still farther-reaching disinfection may be gotten by using the more soluble lactate of silver, as in the cases of anthrax and erysipelas above mentioned.

For rinsing cavities, such as the bladder, etc., Credé uses the citrate of silver 1 : 4000 to 10,000 of water; but for abscesses where there is much pus and where an energetic action is required, he employs the more soluble lactate of silver, 1 part in 500 to 2000 parts of water.

It is a special gratification to him to be no longer obliged to employ iodoform, which is, apart from injections in cases of tuberculosis, but too often an unreliable and insufficient antiseptic.

Pure silver materials only must be employed whenever anything is to be left in cavities or wounds for any length of time. Where silver wire cannot be employed, silk, catgut, and caoutchouc ligatures covered with metallic silver is used, and drainage-tubes

are similarly coated. They thus remain sterile, and any subsequent infection entering through the drainage-tube or from the surrounding tissues is destroyed as long as the silver lasts. For the details of the preparation of these materials, as well as for the application of the citrate of silver in gynæcological, ophthalmic, aural, laryngeal, and genito-urinary practice, Credé refers to the larger treatise mentioned above.

In conclusion, Dr. Credé exhibited the following:

1. White silver dressing.
2. Gray silver dressing.
3. Silk, catgut, and drain coated with silver.
4. Petri's disks, containing—
   - *a.* Silver upon agar-agar infected in sterile strata with staphylococci.
   - *b.* Gold, silver, and copper upon a similarly infected agar-agar plate. Gold has remained intact, silver is partly, and copper is entirely dissolved.
   - *c.* Staphylococcus culture upon agar-agar, upon which has been placed a trace of lactate of silver, forming large sterile strata.
   - *d.* Disk similarly prepared and charged with a trace of citrate of silver, also forming large sterile strata.
   - *e.* Gauze, threads, and drains upon infected agar also forming large sterile strata.
5. Two drawings of silver with sterile surroundings infected with streptococci.
6. Citrate of silver and lactate of silver in dry powder.

Reports of Society Meetings.

AMERICAN DENTAL ASSOCIATION.

(Continued from page 29.)

August 6, 1896.—Third Day.—Morning Session.

The meeting was called to order at 9.30 A.M. by the President, Dr. J. Y. Crawford.

The minutes of the previous session were read and approved.

Dr. Harlan.—According to a rule adopted at Old Point Com-

fort two years ago, the two divisions of the Executive Committee were to provide for two general addresses to be delivered to the American Dental Association on the second and third day. This year I notice that that is omitted from the programme, and that the minutes of the last year's meeting do not show that any persons were appointed to deliver those addresses. If the Executive Committee do not desire to provide for that, I think it would be a good plan to have the gentlemen who are to deliver the addresses nominated from the floor and confirmed by the Association, and so take it out of the hands of the committee. It would have added very much to the success of the meeting if the addresses had been provided for this year. It would be a good plan, and would take away something of the narrowness of the addresses that are made from the sections, as they would be on some topic of general interest. If the Executive Committee would provide for these addresses, I should be satisfied; but if they do not, I think the members should take the matter into their own hands.

Dr. Crouse.—The Executive Committee owe the Association an apology. We had forgotten the matter, as it was a new movement, and the matter was not thoroughly carried out last year.

I made a partial report on behalf of a committee appointed to promote or increase the interest between the local societies which make up this body and this body itself. The duties of that committee were very imperfectly performed last year. The chairman of the committee has gone away, and requested me to say that he must be relieved from his duties. I think the work that is designed to be performed is probably as important as that of any committee of this Association. I move that we have a continuation of the work, to be performed by a committee appointed by the chair. It is a mistake to expect members of the profession to come here and, receiving no benefit, to continue to do so from year to year. This Association will be less than an ordinary mass-meeting, unless we get the co-operation of the local societies and their delegates in the way of making reports in the sections. I shall make another effort in that direction if the chair sees fit to appoint me on that committee.

Dr. Fillebrown.—I second that motion. I am heartily in favor of this proposition of Dr. Crouse's. It looks to me exceedingly practical, and a line on which we will make the society interesting. I would like to see the local societies interested, so that they shall examine the papers that are presented to them during the year, select their premium paper, have it put in proper shape, with draw-

ings properly elaborated, and bring it here to have it read by the delegate, so that the delegate may come fully accredited with the reading of the paper that has been read in his local society. Then the transactions of this society will represent the scientific and literary production of the year. I want to see so many papers come up that this society can have its selection, that it will be considered an honor to have a paper read here, and instead of accepting anything that comes, without reference to its quality or quantity, we shall have those papers put under a censorship. We will then have the character of our proceedings immensely improved. The present rule of the society is that any paper that has been read by title in the local societies cannot be presented here; but a man will not wait a whole year to say here what he has to say. He will give it to his own local society.

Dr. Fillebrown reported on behalf of the Committee on the Union of the American Dental Association and the Southern Dental Association. He said that at the meeting of the Southern Dental Association after the appointment of this committee (as it was not held until after the last annual meeting of this Association), it was impossible to have any correspondence on the subject or to take any action in the matter during the years 1894 and 1895. At a meeting of the Southern Dental Association, held in Atlanta in October, 1895, a committee was appointed to respond to the invitation of the American Dental Association. The committees have had considerable correspondence during the year, and report the following communication from the Southern Dental Association:

"That the committees have been unable to come together, and, as a result of the correspondence, advise that an effort be made to have both societies hold their next meeting at some time and place which the committees might agree upon, and the Associations dispose of the matter. The Association recommended the matter to the committee to make final report to this society at its next annual meeting, and state that it would meet the approval of the Southern Dental Association if the American Dental Association will meet at Old Point Comfort on the first Tuesday in August, 1897,—the same time and place that the Southern Dental Association has voted to meet.

"S. W. Foster,
"*Secretary,*
"*For the Committee.*"

Your committee recommend the acceptance of the suggestion of the Southern Dental Association as to place of meeting, and also that the committee of the American Dental Association be continued another year.

A motion was made to adopt so much of the report as does not conflict with the by-laws of this Association and the programme adopted for this meeting.

Motion carried.

Dr. Barrett, as chairman of the Committee on the Revision of the Constitution and By-Laws, reported as follows:

We have made our report years ago, and it has been from time to time put off until I supposed the subject was entirely forgotten. At that time there were some provisions adopted by the committee after a great deal of thought, wide correspondence, and careful consideration of the whole subject, and it seemed to the committee that it would be wise for this body to adopt them. I think what I thought then,—that it should be considered, and it would facilitate the objects of this meeting very much.

Dr. Holly-Smith.—I move that the Association accept the report, and that the committee be continued.

Dr. Crouse.—We thought we had a good reason for deferring action on that report, on account of the extreme anxiety that those who have thought of the subject carefully have felt, of having one grand association that should be national in its character, and we did not wish to change our by-laws until the question was settled. If we do, of course those coming to unite with us (or we with them) will want to have something to say as to what the constitution should be. The society has not ignored the report, but it has been postponed to get the union of the profession in one national organization.

Dr. Holly-Smith.—I made the motion to continue because I thought the committee was in a position to be referred to by any future organization of this society, as part of another organization, and I thought it would be well to keep that committee intact until we might come to them and ask them to help us in another work. I would amend the motion by asking that the committee be continued and the report received.

Dr. Barrett.—This committee has never felt offended by the action of the Association, but we thought the subject did not meet with approval and that the time was not ripe for the reception of the work of the committee. We are willing to do whatever we can to forward the best interests of the Association.

Motion carried.

A motion was made to pass Section VII., Anatomy, Pathology, and Surgery.

Motion carried.

Section I.—Prosthetic Dentistry, Chemistry, and Metallurgy—was then called. Dr. Boice stated that the chairman of the section had been unexpectedly called away. The section has nothing to present, and they regret it very much, as they recognize the importance of the work of that section.

Section II., Dental Education, Literature, and Nomenclature.

Dr. Ottofy.—Last year Section II. took up so much time that this year it intended to make a very brief report. Had we known that all the sections would decline, we would have made a much longer report.

Dr. Ottofy then read the report of his section, of which an abstract follows:

Since 1887 this section has regularly reported the number of dental colleges in active operation in the United States, with such additional information as has been deemed proper. The rule followed simply aimed at a truthful report of the number of colleges, newly-organized institutions, and such other incorporated bodies as conferred the dental degree. No attempt to discriminate has been made. Inasmuch as the list thus published by this Association each year is being accepted and offered as evidence of the existence of dental institutions, it seems manifestly improper that institutions reputed to exist, but regarding which no information can be obtained, should be placed side by side with institutions which are established and known to be engaged in the work of dental education.

The innovation, therefore, begins this year of separating the dental schools of this country according to the information in possession of this section, dividing them into three classes, to wit:

1. Dental colleges in active operation.
2. Dental colleges organized during the past year.
3. Corporations conferring the dental degree, but regarding which no further information is at hand.

There is a total of forty-six dental colleges in active operation, three of which were organized during the past year, and three corporations conferring the dental degree.

There were matriculated as students of dentistry during the past year six thousand two hundred and ninety-three persons, six thousand and thirteen of whom were in actual attendance, and

upon fourteen hundred and forty-six of whom the dental degree was conferred.

It is deserving of mention that every college now actively engaged in teaching, or which has been organized during the year (except one whose announcement has not yet been published), is either a member of the National Association of Dental Faculties, or an application is pending, or it has announced its intention to conform to the rules of the National Association of Dental Faculties. In the latter class there are but three colleges in the country, and these intend to apply for membership as soon as they have complied with certain necessary requirements.

This information might not be considered of much consequence, were it not for the fact that the National Association of Dental Faculties has, at its session this week, taken one of the most important steps in the history of dental education, by the adoption of a plan for the admission of students to colleges. Hitherto an applicant for admission presented himself for admission, and it was left wholly to the judgment of some official of the college to accept or reject. There is no doubt that this imperfect system resulted in the admission of many who were not properly qualified. By the plan just adopted, the requirements for admission into any of the colleges are identical, and the requirements are graded from year to year in such a manner that, beginning with next year, the educational standing of our students will be higher and increase within four years to a plane practically equivalent to a high-school education. The section deems this action one of the most important advances made in dental education.

The section has no further report to make on dental education or literature, desiring these subjects passed without discussion, in view of the amount of time devoted to them last year.

Dr. L. P. Bethel, of Kent, Ohio, then read a paper, entitled "A Suggestion regarding a Possible Means for instructing the Public in Dental Matters." An abstract follows:

If it be desirable to educate the public in a popular way regarding oral and dental hygiene, etc., some active steps should be taken, and this representative body—the American Dental Association—is the one to take the matter in hand. The subject has been discussed in our societies time and again, but this has not benefited the public, for we have taken no active steps towards instructing them. The following plan seems to the writer to be the most feasible of any yet presented:

Let the American Dental Association appoint a committee.

The duties of this committee shall be, first, to correspond and arrange with leading dailies in the United States, one only in each city, to publish one prepared article in the Sunday edition each week until a whole series is printed, the articles to go to the publishers thoroughly edited and ready for publication, and to be gratuitously given, provided an announcement be made each week in the daily, advertising its Sunday edition, calling attention to the forthcoming article. The Sunday paper is suggested because it has a larger circulation and is more generally and thoroughly read than the dailies, although the Saturday or Monday issue could be used if desired. If this be accomplished, the next duty of the committee shall be to appoint prominent men in the profession to write a series of articles in popular style, bearing upon every desirable phase of the subject in hand, each person to write one article only, and that to contain not more than one thousand to fifteen hundred words. These articles, when written, shall be sent to the committee to be edited for the press. When set in type, proof will be sent to the author for revision. When corrected, enough copies will be printed from the galley to supply the papers secured, proofs of each article to be sent publishers about one week in advance, and the article to appear simultaneously in the desired edition of all the papers, and this continued each week until the whole series is published. There are about fifty available papers, and they reach fully twelve million readers. Then, if desired to further extend this knowledge, dentists in towns can get their own paper to republish the articles without credit and call especial attention to them. When set in type, the matter can be paged and stereotyped for pamphlet use, if desired. The pamphlets would be very cheap, and enable dentists to supply their patients and also teachers in the public schools, that they may read portions of the articles to pupils in the school-room. The expense of carrying out this plan would include type-setting, stereotyping, and postage, and reasonable compensation should be given to a member of the committee who attends to the proof-reading, stereotyping, etc., for the time spent by him. The whole expense would not be great. If each State and local society would contribute a few dollars, aside from that given by the American Dental Association, there would be ample funds to carry this into effect, and who could estimate the benefit to millions of people?

Dr. Ambler.—What I say will be in reference to the last paper which was read. I have always been a firm believer in the fact that the more we educate the public the better it will be for them

and the better it will be for the dentist himself. It makes a practical thing of it and brings it right home. It will assist you in every-day practice. This idea of Dr. Bethel is a very good one indeed, and I consider it a practical thing. A great many, at first thought, would say it will not amount to anything, that every man will be advertising himself, and it should not be before the National Association. I feel otherwise. In 1872 the editor of a weekly paper called *The Ohio Farmer*, which had been published in Ohio since 1846 (and with whom I was acquainted), asked two or three dentists in the city of Cleveland to write a few articles for the popular education of the public. He did not succeed, and finally he came to me and asked me to do it. At first I declined, thinking it would be considered an advertisement; but after a second thought and further talk in regard to the matter, I concluded to do so. In *The Ohio Farmer* of 1872 you will find a series of articles published weekly, entitled "The Care and Preservation of the Teeth," written in a plain, popular style, so that any one could understand them. So you see I am in hearty accord with this idea of Dr. Bethel's. I presume there are other gentlemen here who have done the same thing in times past. I believe it to be valuable, and if we could put it into practical operation I would vote for it.

Dr. Templeton, of Pittsburg.—I have a few words to say on this subject. What I shall say is in reference to the last paper. I endorse it all except one thing; I believe in the Christian religion, and I am opposed to the Sunday portion of the report. It is not necessary that we should support Sunday newspapers. I do not buy the Sunday newspapers when I am at home, and I cannot vote to put anything in a Sunday newspaper.

Dr. Wilson.—I would like to ask Dr. Templeton if he buys the Monday morning paper. If so, which does he patronize,—the Sunday work or the Saturday work?

Dr. Molyneaux.—Is this not a good Christian cause right along? I think the Sunday paper is a very good paper to put it in.

Dr. Taft.—The committee contemplated in the paper of Dr. Bethel would be a permanent committee to carry out the recommendation, not to consider whether the question should be adopted. I think the proper course would be to move the adoption of the suggestions in Dr. Bethel's paper, and I make such motion.

Motion seconded.

Dr. Barrett.—I am opposed to anything of that kind. We want to keep out of the newspapers. If we put articles into the news-

papers, we follow the precedent that has been set by the disreputable portion of the profession. It is very nice and pretty to talk about the education of the people through the newspapers, but for one insertion that we will make, ten will be made by the other side, of propositions that we do not desire to sustain. We cannot place it so emphatically before the people but that the quacks, who have more experience in this advertising matter and have personal ends to gain, will emphasize their own standing ten times more. The eagle is a very ungainly bird when he attempts to walk on the earth. The barn-yard fowl is very graceful when he crows and struts, but the eagle can soar into the empyrean, while the other is of the earth, earthy; and this advertising, whether it comes from the profession or from the people who oppose the profession, is of the earth, earthy, and you cannot elevate it into the upper strata by any means that you seize upon to make it respectable. You are adopting the methods of the enemy, and they are naturally debasing in their character. We cannot afford to have anything of that kind. If the American Dental Association adopts this, I cannot endorse it.

Dr. Morgan.—Dr. Barrett is quite correct on this subject. I do not think that the gentlemen of this Association, if they consider carefully what these suggestions involve, would be willing to undertake them, because of the immensity of the thing, in the first place. In the second place, if you adopt that plan, you invite the whole rabble of cheap dentists into the papers in competition with you. They will put in two or three articles to your one, and they will mislead the people more than you will educate them and correct their views. You simply invite all that class of men that this Association has ignored and debarred from the privileges of the Association to meet you on ground where they have the advantage of you very largely. Let them alone. Keep out of the newspapers. There are other means that we can adopt for the education of the people. Very few people accept what is published in the newspapers, and if it is published in the interest of any particular class of individuals, whether professional or not, it at once comes under the ban of suspicion, unless you will put your name to it, which I do not think you will care to do. If you want to educate people by publications, make them of your own, where you have entire control of them, and where you can put them where you desire and keep within the bounds of professional dignity. Do not invite the sort of thing that we would get from the publication of these things in the secular papers.

Dr. Barrett.—I move that so much of the report as refers to publications in the newspapers be laid on the table.

Motion carried.

A motion was made to receive Dr. Ottofy's report and place it on file.

Motion carried.

Dr. Guilford then reported on behalf of the Special Committee on Nomenclature as follows:

Your committee would report that it has endeavored to carry forward its appointed work to the best of its ability. The tabular portion of last year's report, which could not be read on account of its length, has since been carefully revised, and appears in the published transactions. Notwithstanding the great amount of time spent on it, it is not entirely free from errors and inaccuracies. Some of these have been called to the attention of the committee, and it is hoped that others will be. While the report was in type, several hundred reprints were made and sent to individuals in different parts of the country, with the request that the report be brought before the societies. This was done in several cases, but the results have been published in one instance only,—namely, the Academy of Stomatology of Philadelphia. Its consideration of the subject is printed in full in the August number of the INTERNATIONAL DENTAL JOURNAL, and parts of it are incorporated in the present report.

Your committee had some difficulty in deciding on a system of phonetic spelling in indicating the sounds of vowels and syllables, but finally decided to adopt that used in the "Century Dictionary."

Your committee has thought best to append a list of terms the use of which should be discontinued, and a brief summary of the discussion at the Academy of Stomatology of Philadelphia.

We have also a short paper from Dr. Thompson, a member of the committee. He says it was the late lamented Dr. Kulp who said that the nomenclature of a profession is the sign-board of its intelligence and training, or, as Dr. Ward has said, we can no more dispense with nomenclature than we can with language. It is the language of science, and as such should possess all the precision that science requires in all departments. Those who regard it as of no value should not forget that the great Darwin considered the subject of nomenclature of such paramount importance that he actually bequeathed a sum of money to be devoted to it. All scientific workers, no matter what branch of science they pursue, feel the same,—that the language of science and the nomenclature of its facts, espe-

cially in the organic world, should be reduced to the most perfect form for their use.

I would state in connection with this that Dr. Thompson stated, in a letter he sent to me, that the work of the committee had received the approval of one of our highest scientific authorities in America,—Dr. Cope, of Philadelphia.

Dr. Barrett.—I can most heartily commend this report, and yet I am inclined to think it oversteps the bounds that should be prescribed for the work of this committee. It is not a committee on philology. It has for its especial sphere the consideration of dental nomenclature, and if we go outside of that into the general field of philology, we are opening something that will be so broad and so wide that it will take the place of other matter which we want to discuss. The sole criticism upon the paper is that it goes beyond the bounds which should be prescribed for the consideration of the subject before the committee, and enters into the general field of philology, which does not belong to us to consider. With that single criticism I most heartily commend the paper, because it is in the line of general advancement.

Dr. Taft.—I should like to know how we are going to study the subject of nomenclature without words. Dr. Barrett condemns the report in that particular,—that it enters upon the consideration of the subject of philology. If he can separate philology and nomenclature, he can do what some of us cannot do.

Dr. Barrett.—We are supposed to have some knowledge of general literature and of the general nomenclature. The subject for consideration of this body is that which is professional. When we enter the general field of philology, it is too wide for our consideration, as I said before.

Dr. Stellwagen.—Having done a little work in that direction, I can appreciate what the labor of this committee has been, and while I heartily commend it, I think the committee will probably feel more complimented if, while accepting its report, we put off the acceptance or endorsement of these words until we have seen them in print and examined them. Therefore I think next year would be time enough to endorse the pronunciation. Some of the words as they were read seemed a little peculiar, and I think it would bear a close examination into the etymology and meaning of the various forms through which these words have reached the English language. It would be profitable to us all to study them. I hope in accepting the report we will not accept the conclusions as to pronunciation.

Dr. Guilford.—The committee that has undertaken this work has pursued it with the sole object of the good of the profession. We want to do what we can in the way of dental education, and we are glad to receive criticisms or suggestions. If the gentlemen have any objections or criticisms to make, we will be very glad to receive them. The work can be greatly improved upon, but we cannot improve it without your help.

Motion carried.

Dr. Watkins stated that Section III., Operative Dentistry, had nothing to offer. Dr. Fuller did not know that he was elected chairman of the section until a few days before this meeting.

Dr. Crouse.—We have adopted a programme for this meeting, which sets the hour of eleven o'clock to-morrow for selecting our next place of meeting, election of officers, and other miscellaneous business. I think it would be well to rearrange our programme and have the meeting this evening at five o'clock. I would make a motion to that effect. Many gentlemen have requested me to make this motion so we could get through with the business of the Association.

Motion carried.

The chair appointed on the Committee on National Museum the following gentlemen: Drs. Donnelly, Taft, McKellops, Henry W. Morgan, and Fillebrown.

Drs. J. N. Crouse, L. P. Bethel, and A. W. Harlan were appointed on the Committee to promote Interest in State and Local Societies.

Dr. Crouse.—This committee wants power to make its own selection in the local societies as to who shall make the digest of the work done during the year.

The President.—As there is no objection, your committee will have that power.

Dr. Henry W. Morgan was substituted in place of Dr. Rhein, resigned, as a member of the Committee on Nomenclature.

The Executive Committee nominated the following gentlemen to address the Association at the meeting in 1897:

Dr. A. W. Harlan; subject, "Miasmus and Infection."

Dr. Cassidy; subject, "The Relation of Chemistry to Dentistry."

Dr. Taft.—The Committee on Necrology has found it impracticable to meet, as some of the members have gone, and it has not been found possible to formulate the notices during this meeting. At the suggestion of Dr. Pierce, we ask that these notices be prepared within a few days and sent to the secretary.

The request of the committee was granted.

Dr. Carroll.—I was advised by the chairman of Section VI. that he had not been able to get his committee together, and hence whatever matter there might be before the section had not been presented to this body. I prepared a paper at the request of the chairman of that section, and I learned this morning that he was not able to get his committee together, and hence that paper would not be presented; therefore I ask that it be returned to me. I have been a member of the society since its organization, and I have never before prepared a paper. This time I did, and the paper is returned without the section being called together.

The President.—The chair would state that it is only competent to have before this body such matter as may come through the regular channels of the sections, either reported upon by the chairman of the section or the secretary. The secretary of Section VI. stated that he had reported all the matter that had been presented to him.

Dr. Corydon-Palmer was accorded time in which to present what he wished to say to the society. He spoke as follows:

Yesterday I unexpectedly said part of what I expected to say to-day. As I referred to the past a great deal, I will not say much about it; but I wish to make these statements, that I am not in trade, and what I have done has been in the way of artistic design. I have given everything I have to the profession and to this Association. I do not wish to be rated as an instrument-maker. My desire has always been to be known as a fine operator. If, in my daily practice and that which I consider to be art in operating, I conceived the idea of certain appliances or adaptations, I have been happily able to produce them myself, without putting them into other hands to be brought forward. What I have to-day I prepared especially for this meeting and as a continuation of what I did in 1873. It is a revision of the instruments for putting holes in the rubber dam. At that time a large case of instruments was offered, and it contains instruments in the form which would place the hole in the rubber dam and enable one to extend it when putting it on over other teeth. I have encountered opposition in the making and offering of my appliances because people said the principle was false, that the steel would cut, and that I was all wrong. Notwithstanding, I have been able to do it myself and have had it in use ever since. These are my gems, and I wish to preserve them carefully. I brought forward the idea of having a curve in the joint of the instrument, so that in using it in and out

the joint is out of the way, which enables one to see what is being done. Here is a small-sized one for putting in wedges between teeth and taking them out. That is its principal use, but it is also useful to take off ligatures. You all use wood for wedges. The orange-wood is not better than straw. Here let me say with all honor and appreciation of the separators which we have,—the Perry and the Bonwill and others,—that they all have their places; but notwithstanding that, we sometimes need other wedges. This little instrument is the one to put them in with and take them out, and you can use it in the back part of the mouth and look in and see what you are doing. For wedges you should use nothing but the finest quality of Turkish boxwood. Cut it in suitable strips, and you have something you can rely on.

Here is my wedge-cutter. It is curved. Mr. White, who favored all of my appliances, opposed me in this. He said the joint was false and was not in accordance with true mechanical principles; but I said if the surgery of the mouth calls for it, it should be made in this way. You can reach any part of the mouth with this and see what you are doing. The cutting part is not so broad as to be liable to clip a hole in the dam, which the other cutters do. If these instruments are reproduced, and you get one, do not use it for anything except wood or upon a hard substance, because you will spoil it if you do. Do not use it for the engine bits; there are pliers made for that purpose. This is for wood only.

Here I have three sizes of instruments for cutting holes in the rubber dam. They are numbered, and make three different-sized holes. They cut upon steel and cut the piece out nicely. If you put the dam in the mouth and you wish to extend it over another tooth, which is very frequently the case, this will reach any part of the mouth, and you can put the hole wherever you wish. I have made the instruments entirely myself. It is the work of my own hands. There is an advantage in what I am doing, because, knowing the use of the instruments, and the want of them, I have made them just as they were needed.

A vote of thanks was offered to Dr. Palmer for his kindness in exhibiting these instruments.

Dr. Stellwagen.—I would like to say that I have had one regret in my lifetime, and that was that once, in speaking of these instruments or some similar ones which Dr. Palmer had called my attention to, I said they were poetry in steel. After I had put the manuscript into the hands of a dear friend for revision, he objected to

the phrase, and I allowed that language to be changed. I have thought ever since that I was cowardly because I had permitted it to be changed. I repeat now that those instruments are poetry in steel. I have used instruments similar to them for years, and for sweetness of cutting those wedge-cutters seem to me always as if I were cutting through oil rather than through wood.

Adjournment.

(To be continued.)

THE NEW YORK INSTITUTE OF STOMATOLOGY.

A MEETING of the Institute was held Friday evening, November 13, 1896, at the residence of Dr. S. H. McNaughton, 63 West Forty-ninth Street, New York City, the President, Dr. Benjamin Lord, in the chair. The minutes of the previous meeting were read and approved. Dr. Davenport read the following report of the special committee, appointed at the last meeting, in the matter of the death of Dr. C. F. Ives:

MR. PRESIDENT AND GENTLEMEN,—The sad death of Dr. Charles F. Ives, which was so feelingly spoken of at our last meeting, caused the appointment of your committee, and we desire to recommend that as a society we record our sense of loss, and our appreciation of his high personal and professional qualities, by entering this expression of them upon our minutes, and by making them a part of our transactions. We naturally recall the fact that he took the greatest interest from the beginning in the organization and proposed policy of this Institute, and that he was willing, notwithstanding the discouragements of failing health and consequent inability to attend to his practice, to assume the duties of secretary in our organization. He was born in New Haven, Conn., on October 5, 1829, and received his early education in that town. In his younger years he became a telegraph operator, and his acquaintance with a dentist and his interest in the mechanics of dentistry led him at that time to conclude to make it his vocation. He became a student of Dr. Perkins, the inventor of the Perkins operating-chair, and after a sufficient training practised successively in Waterville, Watertown, and Little Falls, N. Y. He remained seven years in the latter place, coming to New York about the year 1866. He exercised unusual skill and thoroughness in his professional work, and his services were characterized by sin-

cerity of purpose and correct judgment. He was an expert in the forming and tempering of instruments, and was fond of exercising his art in this way. In his personal intercourse he was cordial and kindly, and always ready to undertake a task or duty for those to whom he was attached. He served the New York Odontological Society as secretary for several years, and later took the same duties upon himself here at our request. It will be remembered, also, how constantly at our social gatherings around the dinner-table he was chosen cashier without a murmur on his part. He had musical ability of no mean order, and for many years was an organist in church. Although naturally reserved and retiring, his intellectual and social qualities made him a desirable comrade to those with whom he felt acquainted, as we can all testify. His latter days were sad and lonesome, yet his independent spirit did not allow him to yield to the desire of friends to entertain him in order to cheer him. He died on September 14, 1896, and his body was interred at Champion, Jefferson County, in this State.

(Signed) J. MORGAN HOWE.
S. E. DAVENPORT.

On motion, the report of the committee was accepted and ordered on file.

COMMUNICATIONS ON THEORY AND PRACTICE.

The President.—We now come to communications on theory and practice. Any one present, whether a member of the society or not, who has anything new or of special interest, is invited to present it at this time.

Dr. Davenport.—While I hardly feel like beginning, it seems to me that this very important department of our evening's programme ought not to pass. It is said that we learn more from failures than from successes; and I should like to describe one of my failures, a failure of diagnosis. Fortunately, no damage was done, though, perhaps, the next time we would not be so fortunate. A gentleman consulted me a few days ago concerning a swelling about the roots of the first right superior molar. It had every appearance of an alveolar abscess in one of its primary stages; the tooth was slightly elongated, very tender to pressure, even of the tongue; the buccal side of the gum being considerably swollen, the palatine side a little. The other teeth in the vicinity were not tender to percussion. The patient, himself a dentist, agreed with my diagnosis, that the first molar was a tooth without a living pulp; and as there were no large fillings, and no history of recent work upon

it, it seemed like one of those cases of dental suicide. With a sharp bur I began to drill through a small tin filling in the anterior part of the crown of the tooth; but as soon as the bur pierced the filling and entered the dentine, the patient winced, and not from the pressure. In short, the pulp was alive and apparently in a normal condition. There had been no error as to which tooth was the cause, or at least the centre of the trouble, for the others were perfectly comfortable to all tests. The patient is, perhaps, twenty-five years of age; gums healthy; no considerable amount of tartar in the mouth, and yet the history of that tooth for the last two days has caused the patient and myself to come to the conclusion that this is a calcic abscess, and that the pulp of the tooth is in no way involved. A very fine scaler introduced on the posterior side of the second buccal root discovered a few nodules of tartar a short distance above the normal margin of the gum, and becoming rather persuasive with the scaler, a little pus was finally reached. Hydrogen dioxide being used to syringe at that point, relief has come slowly. That was the only point about the tooth where any tartar could be found. This is the third case in my experience where teeth with every possible indication of ordinary abscess from a dead pulp have been found to have calcic abscesses. I have seen very little about this condition in dental literature.

Dr. McNaughton.—Dr. Kirk has recorded one case in his own mouth.

The President.—We will now pass to the reports of the standing committees. The first is the Committee on Operative Dentistry. Dr. Bogue, the chairman, is not present; but it is well understood, I presume, that members of the committees may make individual reports, and not depend wholly upon the chairman to make a report for the committee.

Dr. George A. Wilson.—Might I suggest, Mr. President, that Dr. Allan be called upon to report the result of the use of the cataphoric instrument in obtunding for the removal of a live pulp? I had an invitation, but was unable to witness the operation.

The President.—If Dr. Allan has anything of interest in regard to operative dentistry we will be pleased to hear it.

Dr. George S. Allan.—The case Dr. Wilson alludes to was a right superior lateral. The lady came to me with one of those hideous gold caps over the tooth, and wished to have it changed. On taking off the cap I found that the pulp was alive, and the crown badly decayed.

It was impossible to put a porcelain-faced crown on the root, owing to its prominence, without destroying the pulp, and there was every indication that the pulp had commenced to destroy itself. I applied citrate of cocaine with the cataphoric current, using eight or ten cells of the Van Woert apparatus. I continued the application for about fifteen minutes, and then, as it was getting late, I cut the operation short, although I felt quite certain that I had not obtained complete insensibility. I found that the pulp was so nearly insensible to pain that two-thirds of it was removed without the patient wincing or paying any attention to it. Then, rather than continue the operation, as the patient was tired and nervous, although she acknowledged she was not in pain, I applied a local obtundent and dismissed her until morning, when I finished the operation by the use of ordinary arsenical paste. Five minutes more of the cataphoric current would undoubtedly have produced complete insensibility, and the whole pulp could have been removed without pain. My success with the cataphoric current seems to me to be greater every day that I use it. I do not find as much use for it in obtunding sensibility as some others do. I have noticed one or two peculiarities: in one case I applied the current and the patient was delighted,—said she could come now to the dental office and not feel worried, all fear of the operations having been removed. At the next operation I supposed, of course, that she would want the cataphoric current; and she said, "Doctor, is it all ready?" To which I replied, "Yes, it is all ready." "Well," she said, "never mind; keep right ahead, and if necessary we will have it later." But, although she has had work done several times since, she has not found it necessary to have the cataphoric current. I think the moral influence, however, was very satisfactory.

While we are speaking of the cataphoric current I wish to exhibit this card of specimens, and at the same time request the secretary to read an article which has induced me to write to Dr. Bethel, and from whom I have obtained the privilege of exhibiting his specimens. The idea illustrated here is the use of the cataphoric current in forcing nitrate of silver into the dentine of the roots of dead teeth. The subject is exceedingly interesting, and the success that Dr. Bethel has met with, as exemplified in the specimens he has so kindly sent here for our examination, I think warrants my asking you to listen to this article. I will therefore call upon our secretary to read the article, and then exhibit the specimens for your examination.

The President.—Gentlemen, you will give your attention to this article presented by Dr. Allan.

The secretary read, from the *Dental Digest* for October, 1896, an article entitled "Lining Root-Canals," by S. P. Bethel, D.D.S., M.D., of Kent, Ohio; also a letter of Dr. Bethel to Dr. George S. Allan, explaining the exhibit of specimens.

Dr. Allan.—I wish to pass around this card of specimens that Dr. Bethel has so kindly sent me. I think it will pay all to examine them with the magnifying glass carefully, especially No. 4; and notice, also, in No. 2, which was operated on in the mouth, that the crown of the tooth is not discolored perceptibly; showing that there need be no disfigurement from the use of nitrate of silver. These specimens are very instructive as showing what the cataphoric current can do in this direction. I hope to carry on my correspondence with Dr. Bethel, and I feel very certain from the tone of his letters that he will give us the benefit of his future experiments. It will be noticed that the nitrate of silver has penetrated about one-thirty-second of an inch into the substance of the dentine, completely closing the mouths of the dental tubules and preventing the ingress of bacteria.

Dr. W. St. George Elliott.—I happened to be present when this paper was read, and in justice to the profession it appears to me that we ought to get at all sides of the story. The discussion, particularly the part taken by Dr. Taft and Dr. Abbott, was most interesting. While they did not deny the efficacy of the process, they contended that there were certain objections to it, and that precisely the same results could be obtained in the ordinary way; many dentists having used nitrate of silver for many years for that purpose.

Dr. Allan.—I have no objection to the discussion of this paper being read, if the members would like to hear it. I had not the slightest idea of preventing the other side from being heard, but to save time suggested the reading of the article itself.

The President.—Perhaps, as Dr. Elliott was there, he can give us some account of the discussion which may be sufficient for us.

Dr. Elliott.—Personally, I do not think that the opponents of Dr. Bethel made out a strong case. Dr. Abbott seemed to be opposed to cataphoresis in general. Dr. Taft stated that in his own experience he found that the staining complained of was most superficial, and could be readily removed by scraping. This is not in accord with my own observation. While in London, I had a patient who had very protruding canines, and a dentist—I am sorry

to say it was an American dentist—had treated the case in a very heroic manner, had excised a portion of the canines, ground off all the projecting portions, almost exposing the pulp in doing so, and naturally made the teeth exceedingly sensitive. He then applied nitrate of silver; and the teeth were very badly discolored when I saw the case five years afterwards.

Dr. C. B. Parker.—In relation to nitrate of silver; three weeks ago a physician came to my office suffering with a congested pulp. I removed the filling and applied the cataphoric current for thirty minutes, using cocaine, thinking that I could remove the pulp then, but I found it just as sensitive as ever; the cocaine apparently had not had any effect, and the man was suffering so intensely that for the moment I did not know what to do. I made up my mind that cocaine was not going to give me the result that I wanted, and I applied a solution of nitrate of silver, expecting only a temporary effect. I applied the current for six minutes. After two or three minutes he said the pain had subsided, but I thought I would continue it a few minutes longer. I did so, and after six minutes I tested the pulp, and was able to remove it completely without pain.

Dr. McNaughton.—What strength of nitrate of silver did you use?

Dr. Parker.—I make the saturated solution.

Dr. Elliott.—I would like to say that on theoretical grounds nitrate of tin would be preferable to nitrate of silver. Speaking of cataphoresis and cataphoric instruments, I have, like the most of us, paid a good deal of attention to the matter the last few months. My son has been connected with several of the companies, and has had a very extensive experience during the summer, making some two hundred and fifty demonstrations on patients, including pulp-extractions, and there were several interesting points brought out in his experience. One was the fact that cocaine is not to be relied upon when the solution is more than two days old. The second point was that eucaine is found to be in many cases preferable to cocaine; and a combination of eucaine and cocaine seems to be very efficient. Another point was that in single-rooted teeth the result is always more favorable. If the case is not successful it is probably owing to some defect in the insulator of the current.

With the molar pulps there is more difficulty. Of course, the current will not divide itself and pass down through the different roots of a tooth, but will naturally take the channel that has the

least resistance; and the result is that one root may be anæsthetized, while the others are not, and the process has to be repeated, first passing the electrode down into the canal which is most accessible, and afterwards following with the others; and in that way it is perfectly successful.

Dr. Parker.—In over thirty attempts to remove pulps cataphorically, the one I have just referred to is the only one that gave me the slightest trouble, using a solution of cocaine, and that tooth had been giving the patient a great deal of pain for about ten days.

Dr. Allan.—Some time ago I saw an article on gold filling, with special points for hand-pressure. I think I had better read it hastily, and then pass around these instruments, so that all can see them and discuss their merits.

Dr. Allan read an article entitled "Gold Filling, with Special Points for Hand-Pressure," by A. D. Barker, D.D.S., of Grinnell, Iowa. Read before the Iowa State Dental Society, May 6, 1896.

Dr. Allan.—I have a set of points made on this same principle. The S. S. White Company now has the patterns in the Philadelphia depot, and they have kindly loaned them to me for your inspection. There is no doubt but what there is a principle involved in the shaping of these points, and I think a correct one. Take a round cavity and attempt to pack gold perfectly against the walls, with any but very fine points, and the result is that the gold will not be packed homogeneously. That is easily demonstrated. There is an old saying that one cannot put a round man into a square hole, and certainly one cannot pack gold into a round-shaped cavity with square-shaped plugger-points and have a perfect and uniformly condensed plug. The idea that Dr. Barker has is that the cavity, being shaped like the end of the finger, the filling-instrument should be of a similar shape, so that when the gold covers the point of the instrument the gold and the instrument will fit the wall and the gold be packed evenly at that point. The instrument being serrated, of course one gets the benefit of the mechanical principle of the wedge, as well as being able to use the points to burnish down the gold. I would like to call attention particularly to three forms, which please look at with the magnifying-glass. One is round ended and another is flat. The serrations in one case run lengthwise of the point, while in the second they are cut crosswise. The third is simply a fine burnisher. The handles are just large enough to fill the hand, and the short shank gives a power that one cannot appreciate without use. I think these instru-

ments and the principle in them constituted are worthy of much attention.

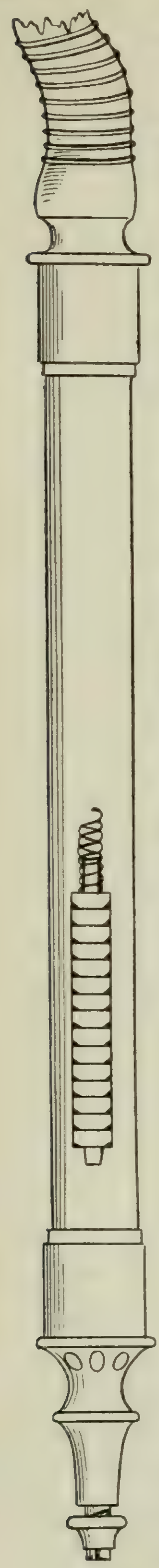
Dr. Elliott.—Mr. President, it has been remarked that it frequently happens that inventions of the same general character are brought out by different men in different places at or near the same time. Dr. De Trey, an old friend of mine, recently brought out a set of instruments of the same general character as these exhibited by the last speaker. The details are not the same, but the principles involved are, and he considers them essential in the use of solila gold. I imported some during the summer, and also secured a copy of the American patent to find out what the gold really consisted of. As far as I could tell it is nothing more than mat gold; not deposited upon a sheet of foil, but merely mechanically locked into a sheet of foil. The objection to the S. S. White mat gold is the great waste in working: the pieces do not hang readily together in the continuous filling of a cavity. I am under the impression that De Trey's gold is practically the same thing. The crystals are finer, however, and seem to require less effort to condense. The principles adopted in filling are the same apparently as those introduced by Dr. Royce and subsequently by Dr. Barker.

Dr. Davenport.—Dr. J. F. Adams, of Worcester, Mass., has recently designed a chin-rest, and I have the principal parts here to exhibit to-night. The portion which I have not brought is the malleable iron socket which is attached to the chair, of no matter what make, by two screws running through the screw-holes already existing in the iron frame of the chair. The socket referred to receives this nickel-plated standard, and this standard, having a ball-and-socket joint, receives the main shank of the chin-rest proper. The portion of the apparatus upon which the patient's chin rests is secured by a ball-and-socket joint, and also has a covering, which can be made an air-cushion by the introduction of air. The two ball-and-socket joints and one single clamp make the apparatus almost universal in its application. I should like to say, Mr. President, that I have possessed one of these rests for several weeks, and while I have not used it many times, it always being difficult for me to adopt new appliances, it has been of distinct service in several cases where important and lengthy operations were being performed upon the lower teeth. There are some patients who, whether from age or nervousness, after sitting for a little time with all the paraphernalia that we subject them to in position, are troubled with a most disagreeable shaking or trembling of the lower jaw, which makes the operation much more difficult because

of the lack of security and solidity of the object upon which we are working. Aside from the help in that way to the operator, this affords a distinct and comfortable rest for the patient. It is also of service when operating for young children, who very often exhibit a marked tendency to slip down upon the foot-rest. I should be very pleased to exhibit this instrument attached to the chair in my office.

Dr. Elliott.—Mr. President, I would like to make some remarks on the subject of mallets. Of course, we all have our opinions, and, unfortunately, we are too much given in public meetings to giving our opinions without giving the proof for the reason that is within us. In the matter of mallets there are a number of opinions, one operator preferring one kind and another preferring another. It seems to me that we are able to bring the question down to something like a scientific basis; there ought to be but one way of doing a thing, and that the best way, and the best way ought to be generally adopted. That leads me to remark that my own belief in the conservatism of the profession is so great that if there were demonstrated here, for example, a process of condensing gold which would meet every requirement, which would be scientific, accurate, and rapid, there would not be a single person who would adopt it, all continuing to do just as they had been doing. Years ago a gentleman in London said to me, My process of filling with gold is exceedingly rapid; I use the hand-mallet and mallet for myself; I have a young lady assistant who conveys the gold, and I claim to be able to do work quicker than it can be done in any other way and equally well. I immediately challenged this gentleman to a trial test in filling. In the course of several weeks half a dozen other gentlemen joined us. Each operator had the choice of his own method, was to take his own time, and keep account of the time consumed, and to perform the operation in his own way. One malleted for himself, one had an assistant to mallet for him, there were three or four who used electric mallets, and one who used the pneumatic mallet. The operations were performed, of course, out of the mouth, and in similar cavities as far as possible to prepare them, cavities in molars that were made difficult of access by the presence of other teeth, all mounted in plaster. The teeth to be operated upon were prepared by a third person and given out by lot, and the operators returned the work performed to an umpire, who made a thorough examination of it. Tests were made of the surfaces for solidity, polish, homogeneousness as far as it could be recognized, the force with which the plug was held in the tooth, and for other points of more or less importance, and the curious fact

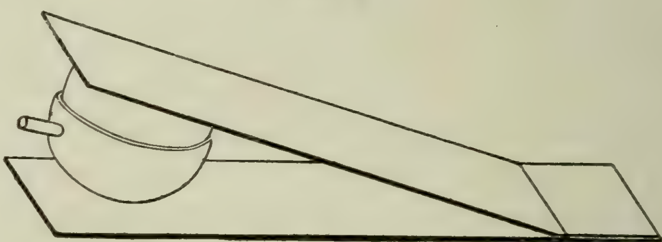
Fig. 1.



which came out was that the shortest operation was performed by a man who malleted for himself. He took an hour and a half to perform the operation, while the one who had an assistant to mallet for him took an hour and three-quarters, and the electrics took about five hours each. (I have not the report by me.) The work performed by the electrics did not prove to be as good as that of the gentleman who had an assistant, and who took the prize. I merely mention this incident on account of the fact that there was not a single man, as far as I know, who changed his mode of operating as a result of the trial.

Now, in regard to mallets, I have made a series of experiments, with a view to getting some positive data in regard to the force required. I have made a number of forms of pneumatic mallets. This one was made in London, and carries a large flyer of considerable weight. Then I found that the majority of patients are somewhat curious to know what was the force used, how the gold was malleted by something which was inside. For the purpose of satisfying that curiosity I made it of glass (Fig. 1), recognizing the fact also that glass has a very material advantage in causing less friction. Then I had to get over the difficulty in connection with glass, the liability to breakage, and that I succeeded in overcoming by receiving the blow on a spring. I have reduced the bellows to its simplest form. (Fig. 2.) It consists of two pieces of spring brass, two hemispheres, one passing inside the other, which is covered with rubber dam, held by a wire ring, which enables one to change it in a moment. I have used it for two years; the rubber has to be changed once in three or four months. The pneumatic mallet fills a certain field which is not filled

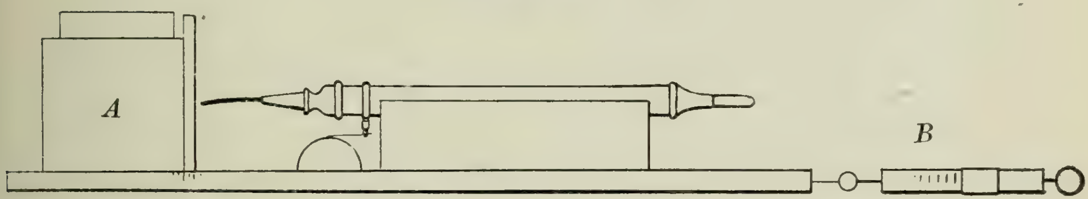
Fig. 2.



by any other instrument. It does not compare, for instance, with the hand-mallet for universality. The class of cavities for which I prefer the pneumatic are those anterior cavities, in what are sometimes, but erroneously, called the oral teeth. There the pneumatic mallet seems to work with far more delicacy of force than any other; is even more delicate than hand pressure.

In some experiments that I have made in regard to the penetrating power of different forms of mallets, I found that by taking an ordinary automatic (Fig. 3),—the well-known Abbott instru-

Fig. 3.



ment, for example,—the average force required to operate it was two and a half pounds. The efficiency of the blow is found by multiplying the weight of the hammer by the square of its velocity. The weight in this hammer is twenty-three grammes. By the use of a heavier weight, whether it be a hand-mallet or an automatic mallet, the whole tooth must naturally be jarred; whereas with the light weight and high velocity its effect would be upon the surface of the gold and not through the body of the tooth.

If we are using soft foil the whole question is altered, as we then wish to produce an effect far beyond the surface. Many gentlemen, in speaking of the relative solidity of their work, say it is solid because it was reduced to a sheet of gold by hammering on an anvil or by rolling, forgetting the fact that it is the hammering or rolling that condenses it. The only way to test the solidity of a filling is by its specific gravity. This instrument has been designed to test the effect of different forms of blows. (Fig. 3.) *A* is an anvil weighing four and a half pounds. A pad of ten sheets of writing-paper is placed against it to receive the blow of the instrument to be tested. Using the same sharp point, it was found that with a pull on a spring-balance (*B*) of two and a half pounds the Abbott penetrated five sheets (flyer, twenty-three grammes) and moved the anvil block one-quarter of an inch, while the pneumatic with light flyer (three grammes) penetrated six sheets and failed to move the anvil even when reduced to two pounds. We are thus led to this conclusion, that in the anterior teeth, particularly when loose or

painful in their sockets, it is best to use a small weight and high velocity, as it packs the gold better and does not disturb the tooth.

I have experimented a good deal with cataphoric outfits of various kinds. I prefer the street current to a battery, but must have it absolutely reliable, and believe I have accomplished it. An electrician of the Edison company was informed that the fluctuation of the current was not more than two volts in one hundred and eighteen on this section, which would make a very small change when only ten volts are being used.

As far as I know, none of the apparatus in present use will give steps of less than one-eighth of a volt. The Wheeler apparatus gives a change of one-fifth of a volt, and steps of this amount are liable to produce some sensation on the part of the patient.

I use the Willms controller, which has one hundred and eleven steps. I have had a special rheostat made. It gives five, ten, fifteen, twenty-five, thirty-five, and fifty volts, so that I can commence with five volts pressure, and in steps of one-twentieth of a volt gradually increase to fifty volts, if necessary. I take current off the main circuit with constant resistance by a shunt, pass it through the Willms milliampère metre, and thus practically get rid of any variation in the street current.

The President.—The Committee on Prosthetic Dentistry, Dr. Bishop, chairman, will now report.

Dr. J. Adams Bishop.—As the chairman of the Committee on Prosthetic Dentistry, I take great pleasure in submitting the following report:

The New York Institute of Stomatology, at its monthly meetings during the first year of its life, has had some rare cases presented to it, showing the results of treatment by mechanical dentistry or mechanical surgery, and it may be years before the like are presented again. Our report is only a review of the cases.

At the November meeting of 1895, Dr. C. O. Kimball reported and exhibited the cast of a case of fracture of the superior maxilla. Miss D., aged eighteen years, was struck with a golf-stick, breaking off the corners of two lower teeth, cutting through the upper lip, crushing in the left upper central and lateral teeth, and separating the two maxillæ at their anterior portion by nearly a line.

Owing, in part, to the extensive laceration of the lip, the jaw was not attended to until ten days after the accident. Then sectional impressions of the upper jaw were taken, the arch restored, and a splint made to fit the model.

The two sides of the jaw were drawn together and the splint applied, pushing out the left lateral and central teeth to their proper positions. Perfect union and firmness of teeth were secured, none of the teeth dying, but a slight permanent separation of the central incisors remained.

At the same meeting I had the pleasure of presenting a patient, the condition of whose mouth was the result of a sharp-pointed stick having been forced through the soft palate, displacing teeth and causing the loss of a portion of the superior maxilla, so that the mechanism of the mouth was greatly injured. The treatment was the same as for cleft palate.

Getting a good impression of the mouth, and especially of the back molars, which would give a good support, I made a plate, covering the mouth and making it air-tight.

The result was most gratifying, especially to my patient. He goes down town to business and does not hesitate to come in contact with any one, as this plate gives him the natural use of his organs of speech.

At a meeting of this Institute held at the Polyclinic College, on February 4, 1896, Dr. Dawbarn gave a lecture and surgical demonstration, as reported in the INTERNATIONAL DENTAL JOURNAL for April, 1896. Dr. Dawbarn described to you the difficulties and the magnitude of the operation he had performed upon a patient whom he exhibited there, but his patient's life depended on his performing it.

The condition of this patient, after the removal of the superior maxilla of one side, was all favorable for a healthy recovery from the operation, after which the parts had to be restored by artificial means. To enable the patient to resume his daily occupation, his voice and looks were the two things to be considered first. A good impression was obtained, and a dental fixture covering the roof of the mouth and supplying the left half of the dental arch with teeth was made. The entire right side is embraced or clasped by the plate, which is so balanced that it is worn constantly with entire comfort and scarcely betrays its presence.

One of the very important departments of prosthetic dentistry is the making of metal dies. The swedging of gold or platinum plates is a delicate thing to do well. Suppose we have a patient who needs a gold plate for the superior maxilla, which means a suction plate. The impression with plaster is the first step. I prepare the mouth for the plaster by wiping off all the saliva that forms a covering over the mouth, really making it larger.

I find by so doing that my impression is so perfect that it is with difficulty I remove it. Then I proceed, using all the care I can so as not to have a blemish upon my cast. I give the impression two coats of varnish which, of course, makes the cast a trifle smaller. Trimming the plaster cast made from that impression down very thin, I fasten it into an iron cup, which is four inches in diameter and three inches high, leaving at least two inches for the metal, hereafter described. The metal is poured into this cup as soon as the plaster is thoroughly dry.

The plaster cast is perfectly dry if no moisture condenses on the face of a mirror held over it. The plaster cast will then receive the molten metal perfectly. As soon as the metal is in the cup, chill the iron cup with cold water on the outside, so as to induce the metal to concentrate around the plaster cast. The metal for this, the female die, is composed of about two-thirds tin and one-third lead. When cold it will readily come out of the cup, and should then be thoroughly cleansed, the plaster cast—for which there is no further use—being cut away.

It is then ready for the male die, which is made of fusible metal, one-half bismuth, one-quarter lead, and one-quarter tin, so that it melts at about the temperature of boiling water. An iron ring is placed upon the female die a little larger than the impression, and the fusible metal poured into that ring. This male die when cold will not stick, but will separate readily, and from the same female die I usually make three or four male dies, numbering them in their order as taken.

I begin swedging upon the one last taken, leaving the first male die, which is, of course, the most accurate for the final swedging.

This method, though possibly somewhat more laborious than some others, produces, in my opinion, emphatically, the most perfect results.

Adjourned.

S. E. Davenport, D.D.S., M.D.S.,
Editor of The New York Institute of Stomatology.

Editorial.

PRINCIPLES GOVERNING MALLETING FORCE.

It is a somewhat singular fact that although the mallet has been used in dentistry almost from the beginning of the present century and has gone through the various phases of development from the ordinary hammer to the electrical and mechanical mallets invented by Bonwill, yet there remains an amount of misconception—or perhaps it would be better called indifference—in regard to the theory and use of this instrument that is not altogether creditable to those who regard it as all important in operative dentistry.

It is, therefore, with unusual satisfaction that the remarks of Dr. W. St. George Elliott in the proceedings of The New York Institute of Stomatology, present number, were received and read. His statements are very suggestive, and indicate a tendency towards a scientific solution of the question of malleting in its entirety.

It is very true, as Dr. Elliott asserts, that it is next to impossible to change the practice of individuals, for, "If a process were demonstrated for condensing gold, which would meet every requirement, which would be scientific, accurate, and rapid, there would not be a single person who would adopt it, all continuing to do just as they had been doing."

This, unquestionably, has its discouraging side, but the true scientist never allows the whims and conservatism of professional thought to disturb him, for his vocation is to attain the absolute, and, this acquired, it is immaterial whether it be adopted or not, for the certainty remains that the truth established will eventually become the dominant thought.

The history of the mallet in dentistry cannot, it is presumed, be correctly written to-day. Koecker, in 1826, writes of it as "surprising and repugnant that after the tooth is prepared for the reception of the stopping, some operators actually *employ a hammer* and *punch* to drive the metal into the cavity of the tooth."

Fitch, in 1835, also condemns it as a "most injurious manner of introducing and compacting the metal." Dr. Atkinson has generally been given the credit of its introduction, but he deserves to be remembered, in this connection, solely because of his persistency in calling attention to its value in condensing gold.

The necessity for a clearer understanding of this instrument in its relation to filling teeth led the writer many years ago to attempt the investigation of the theory upon which it was used and the comparative value of the various forms of mallets then in use. This effort, while not as complete or as carefully prepared as it might have been, occupied much time, and the results were given in the *Dental Times*, 1871. These are condensed in this article.

The theory of the use of the mallet is that it will compact more thoroughly than any regular force, no matter how long continued. This is illustrated simply by the driving of a nail. Pounds' weight may be applied to a nail by ordinary pressure, and it will fail to penetrate the soft wood; but the application of a small hammer will, by the sudden concussion, implant it without difficulty. When the force is equal, the resisting force and the force applied, the union or condensation of gold will be comparatively perfect. The idea that prevails that an increase of force by a multiplication of weight will impact to a greater extent is only in part true; force and weight impact, but an increase beyond certain limits will fail in giving greater density.

The force of a body in motion, or its momentum, is increased by the velocity; if that be doubled the force is doubled, and so on in regular proportion. If, then, one body be in motion and another in rest, the impact produces a loss of force in the body moving, which force is imparted to the one at rest, so that the force of the two combined equals the original force in the moving object. "In all cases the momentum after impact must be the sum of the momenta before impact, . . . so that the momentum lost by one body, by the collision, is exactly equal to the momentum gained by the other." The third law of Newton expresses it,—"Action and reaction are equal and contrary."

If we have a non-resisting or movable body as a base, it is found that every blow struck loses a certain proportion of its effect. It is a well-known law that an appreciable amount of time is required for a blow to distribute itself throughout the particles of matter of the object struck.

If, then, gold-foil be in process of condensation, and a hard base be used to support the matrix, the "hand-pressure" method will produce a density nearly if not quite equal to that where a heavy mallet is used, but if in place of a solid base a soft substance is used to support the matrix, as a cushion, great loss of condensing power is the result. Velocity overcomes mobility, or susceptibility to motion; weight increases it.

What, then, necessarily follows from these deductions? That velocity on a partially non-resisting body, as a tooth in the mouth, is of vastly more importance than weight. Weight decreases velocity. Reasoning then from this basis, it would seem that the most effective mallet that can be made must be one that combines lightness with solidity. Now, where do we find these qualities to the greatest extent? In the light steel mallet, and they are represented in the least quantity in the lead mallet.

To test the correctness of these views, a number of fillings, twelve gold and four tin, were prepared in a hardened polished steel matrix made in separable parts, so that the fillings could be removed without loss or injury. These were carefully marked and separately weighed on the delicate scales of the United States Mint.

It is unnecessary to give the results in detail, but it may be of interest to repeat the fact that it was demonstrated beyond question that rapidity of blow overcame the tendency of motion in an unstable object, as, for instance, the human body during the process of filling teeth. The four fillings made by Bonwill's electrical mallet, prepared by different operators, varied but little. With the matrix placed on a soft cushion, to represent mobility, two weighed two hundred and ninety and a quarter and two hundred and eighty-seven and a half milligrammes respectively. Two on a hard base weighed two hundred and eighty-seven and two hundred and seventy-two milligrammes, showing a difference in favor of the soft base, or, practically, that velocity of blow absolutely overcame mobility. The half-ounce steel hammer on a hard base did more effectual service than a two-ounce lead mallet by seven and a half milligrammes, and a six-ounce wood mallet on a non-resisting medium, as spunk, was not as effective as hand-pressure on a resisting surface, as wood, there being fifty and one-quarter milligrammes in favor of the latter.

The analysis of this table might be repeated further, but it would not change the result, as, for instance, the slow acting automatic gave but two hundred and seventeen milligrammes of weight on a non-resisting base.

The experiments in part detailed were not made with the view of indorsing any special mallet or hand-pressure, but to endeavor to elucidate the reasons for their use and their relative value as condensing instruments. It would, doubtless, have added much to the value of these experiments had the specific gravity of the resulting fillings been taken, as this certainly is the only true test, but for practical purposes it was then considered sufficient to test by

weight upon scales so delicately accurate that no criticism could be made in this direction.

There is one feature of Dr. Elliott's work that seems worthy of attention, and that is the difference in time between the filling placed in by the "man who malleted for himself" and the one who "had an assistant to mallet for him." The first took "an hour and a half to perform the operation," while the latter required "an hour and three-quarters," and those using the "electrics took about five hours each." It is presumed the one malleting for himself had an assistant to hand the gold. This demonstrates, if it demonstrates anything, that the amount of time lost by the operator in picking up gold and, perhaps, annealing is far in excess of the mere packing, and proves the economic value of having an aid in this operation.

It has been too much the custom of some operators to regard as of great importance rapidity in condensing gold. It is certainly important from both the operator's and patient's point of view, but there are so many conditions essential to perfection in a filling that rapidity cannot be considered a question of vital importance in determining the skill of an operator.

The value of the mallet may be regarded as settled in the minds of most operators, and the old method of hand-pressure has largely passed into oblivion. The question of solidity, as an important factor, has also been settled by the judgment of the many as being essential to the preservation of the tooth.

There probably can be no effectual dispute to this self-evident proposition, but the point has never yet been decided, whether severe malleting is better for tooth material than the less forceful pressure of the gold by hand.

Histological workers on human teeth know very well that it is rare to find enamel free from cracks. These can be macroscopically observed, very frequently, upon the labial surfaces of anterior teeth. Every crack so placed in enamel may, if unfavorably situated, become the conduit for fluids and the subsequent pathological changes. That the blows of the mallet add to these fractures there can be no question, and especially must this be true at the cervical border. Hence, in the opinion of the writer, the use of hand-packing along delicate walls should never be dispensed with, whether these walls be lined with cohesive or non-cohesive gold.

The proof of the solidity of a filling is not readily obtained, and it necessarily becomes a mere supposition unless the filling be removed. Dr. Elliott very properly criticises the idea that gold rolled

into plate is a certain demonstration of solidity. The most imperfectly condensed filling can be made as solid as gold plate by this process. The writer in some experiments with gold-foil, some years since, placed in a tooth a large filling by the Herbst method, and purposely made it a poorly condensed filling. This was removed, annealed, and rolled. It came out a very perfect plate. A portion of this was taken and given to Abbey & Sons, who made it again into foil. From foil to foil, while interesting as a fact, proved only one thing, that solidity of the gold filling was not an essential factor in the process.

That the mallet, properly used, has been an aid to more perfected operations cannot be disputed, but it would seem that the dental profession has lost sight of the fact that teeth were preserved quite as effectually under the old methods as they are under the excessive hammering of to-day, and it would seem as though more lasting work could be accomplished, with less nervous strain to patients, if present methods could more generally be engrafted upon those of the old masters, who repudiated the mallet and all accessories, supposed to be so essential for good work at the present time.

CORRECTION.

In Dr. Woodward's remarks, on page 827 of December number, nineteenth line from top, for "cells" read "teeth."

Obituary.

WILLIAM NEWTON MORRISON, D.D.S.

A special meeting of the St. Louis Dental Society was held on December 22, 1896. President F. F. Fletcher opened the meeting with the following remarks:

Members of the St. Louis Dental Society,—It was with heavy hearts that your officers sent you notice to meet here in special session this evening. As lightning from a clear sky came the news to us yesterday morning that one of our oldest, most respected, and esteemed members lay cold in death. A man who but one short week ago sat in his place in the councils of this

body and took part in the deliberations, and whom we had every reason to hope and expect would meet with us for years and aid us with his counsel and advice. A man known and respected wherever dentistry is practised. He was a careful student, a ripe scholar, and an inventor of much ability.

Few men in our profession have been more progressive or lived to see their experimental work in untried fields adopted and approved by all. He was a pioneer in crown-work, bridge-work, and implantation; they stand to-day his most lasting monument. But he is gone. The last page of his life is before us.

My friends, in the death of William N. Morrison the dental world loses one of its pioneers and brightest stars. This Society has lost one of its ablest men and most stanch supporters.

Every member has lost a friend whose place will not easily be filled. May no uncharitable word be spoken; but as we say peace to his ashes, may his memory ever be kept green by the greatness of his achievements.

Appropriate remarks were made by Drs. H. J. McKellops, G. A. Bowman, J. H. Kennerly, and William Conrad.

The following committee, Drs. H. J. McKellops, John G. Harper, and A. H. Fuller, was appointed to prepare a biographical sketch of Dr. Morrison. The committee, on January 5, presented this report:

BIOGRAPHICAL.

William Newton Morrison, D.D.S., was born in East Springfield, Ohio, May 25, 1842, and died in Hot Springs, Ark., December 20, 1896.

He was one of thirteen children of John R. Morrison. Those surviving are James B., Mrs. Lane, of Kansas City, Mo., and Mrs. Cook, of Mendota, Ill.

Dr. Morrison's early education was but meagre, obtained in the common schools. He worked in his father's saw-mill while at home, but left in 1858 and came to St. Louis to become a student of his brother, James B., the inventor of the Morrison dental engine and chair. He arrived at his brother's office penniless, having spent his last money to have his boots blacked and his clothes brushed, so as to make a presentable appearance. The brothers kept bachelor's hall in the same building occupied as an office.

James B. went to Europe in 1862, and William then took charge of Dr. H. J. McKellops's office, who also left the city about that time.

In 1864 he graduated from the Ohio Dental College.

In 1868 he and Miss Cornelia Holme, of Hannibal, Mo., were married. Two sons were added to the family,—Peter Holme and William N. The former is married and has a son two years old.

The doctor was so successful in his early practice as to be able in 1872 to build at 1401 Washington Avenue a house which combines a dwelling and a dental office, each complete for the purpose intended, the plans being made by the doctor and published, with illustrations, in the *Missouri Dental Journal.*

Dr. Morrison belonged to a family of dentists, having an uncle, two brothers, and two cousins who followed that vocation. He always kept abreast of the profession, and was one of the first to use the mallet and to construct gold crowns. He was one of the first to revive the "planting" of teeth, as he called it, his first cases being reported in 1874. The last report was made at the last meeting of the St. Louis Dental Society he attended, on December 1, 1896.

He was fond of visiting the offices of dentists, and whether in town or city made it a rule to call on members of the profession to learn what he could, and to cheerfully give to others ideas which he thought might interest or benefit them. He always took pleasure in entertaining dentists of the city and those from abroad.

He became a Mason in 1865. He was brought up a Methodist, but, after marrying, joined the Presbyterian Church, belonging to the Second.

He was a constant attendant of dental societies, and belonged to the American, Southern, Mississippi Valley, Illinois, Missouri, and St. Louis, frequently writing papers, giving clinics, and joining in discussions; also holding office in those of which he was an active member, having been president of the Missouri and the St. Louis; twice of the latter. He took an active part in the Missouri Dental College, filling the chair of Mechanical Dentistry; also acting as demonstrator, and giving clinics every session when in the city.

Dr. Morrison travelled extensively for a dentist. In July, 1878, he started on a trip around the world, which consumed about a year. While on this trip he learned all he could regarding the status of the profession in the countries visited, bringing home with him specimens of the work found while abroad. He also made a large collection of photographs of places; these he frequently publicly exhibited in the aid of charity. In 1890 he took a trip to Germany for his health. Again, in 1894, accompanied by his wife, he made a trip to Europe. He has been to the West Indies, and also travelled extensively in this country.

Dr. Morrison was a writer for our journals, and many of his articles and items are to be found in the *Missouri Dental Journal* and its successor, the *Archives of Dentistry*, both of which he aided in many ways. Of the former, he was one of the editors of the Department of Mechanical Dentistry for four years.

Dr. Morrison was a public-spirited citizen, and did his share for the public good. He, at his own expense, placed numbers of the streets on Washington Avenue from Jefferson Avenue to King's Highway. He was as well known and highly esteemed in this country and abroad as any dentist in our city. He was the inventor of the Morrison dental bracket, it being one of the first put on the market. He made friends wherever he went, and none ever heard him say aught against any one. His success was gained by hard, faithful work, and he was ever ready to lend a helping hand to his fellow-man.

H. J. McKellops,
John G. Harper,
A. H. Fuller,
Committee.

Domestic Correspondence.

RADIOGRAPHY IN PYORRHŒA ALVEOLARIS.

To the Editor:

Sir,—I have been much interested in Dr. W. H. Trueman's article, in the December number, on "Pyorrhœa Alveolaris," one sentence of which I quote: "I am strongly impressed after all that pyorrhœa alveolaris is merely a germ-disease."

I have made a number of radiographs of the alveoli in patients with slight pyorrhœa alveolaris, and find the edges do not extend as far as normal. This, together with the fact that all observers do not consider absorption of bone due to germs, causes me to believe the germ theory not entirely adequate.

As the disease may not necessarily begin at the surface, and as absorption of the alveoli may in some cases be the first symptom, my object in writing this note is to focus attention on this point in order that my observations may be followed up.

William Rollins.

Boston, December 18, 1896.

THE

International Dental Journal.

Vol. XVIII. March, 1897. No. 3.

Original Communications.[1]

THE DEGENERATE JAWS AND TEETH.[2]

BY EUGENE S. TALBOT, M.D., D.D.S.[3]

(Continued from page 85.)

Crescent-shaped bitubercular, tritubercular, as well as all deformed teeth tend to the cone shape. The malformation of these teeth results from precongenital trophic change in dentine development. It consists in dwarfing and notching the cutting and grinding edges of the second set of teeth, a familiar example of which is seen in the so-called Hutchinson teeth, usually referred to a syphilitic etiology. Hutchinson's position has, however, been more strongly stated than his words justify, since he admits that in at least one-tenth the cases luetic etiology could be excluded.[4]

Lues only plays the part of a diathetic state profoundly affecting the maternal constitution at the time of dentine development. While these teeth may be due to secondary result of lues, they do not demonstrate luetic heredity.

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[1] The editor and publishers are not responsible for the views of authors of papers published in this department, nor for any claim to novelty, or otherwise, that may be made by them. No papers will be received for this department that have appeared in any other journal published in the country.

[2] Read in the Section on Neurology and Medical Jurisprudence at the Forty-seventh Annual Meeting of the American Medical Association, held at Atlanta, Ga., May 5 to 8, 1896. Reprinted from the Journal of the American Medical Association by special request.—[Ed.]

[3] Fellow of Chicago Academy of Medicine.

[4] American System of Dentistry.

In Fig. 31 are seen the teeth of an individual affected with constitutional disease, and by referring to Fig. 15 we shall see that

FIG. 31.

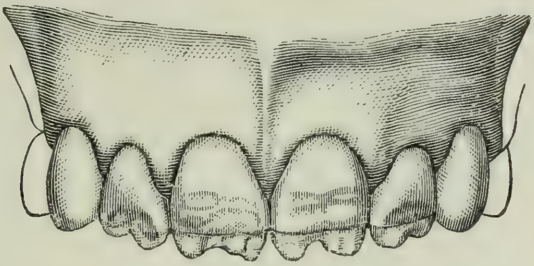
the defective lines represent the respective ages of two and a half, four, and five years. The degree of pitting will depend, as a rule, upon the severity of the constitutional disorder. In the case just cited, however, although nutrition was but slightly disordered, each tooth shows a tendency to conate. Not infrequently are cavities extended completely through the tooth. The cusps of the (permanent) first molars calcifying at the first year are usually attacked

FIG. 32.

also and arrested in development, producing the cone shape. These data, together with dates of eruption of the temporary and permanent teeth, furnish an absolute basis for calculation as to excessive or arrested development of tissue. Fig. 32 shows a very degenerate jaw with cone-shaped malformed bicuspids. The right lateral

is missing, the cuspids are erupting in the vault, and the dental arch is assuming a V-shape. The jaw as a whole shows marked arrest in development. Fig. 33 shows "Hutchinson" teeth. Were the first molars visible they would present marked contraction of the

FIG. 33.



outer surface with a malformed centre. Referring again to Fig. 15 we observe that trophic changes affected the system at the age of birth. The outer surface exhibits a tendency to take the cone shape. Figs. 34, 35, 36, 37, and the molars in Fig. 30 exhibit mal-

FIG. 34.

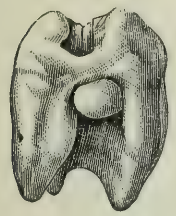


FIG. 35.

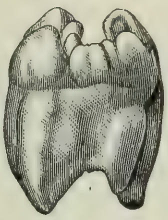


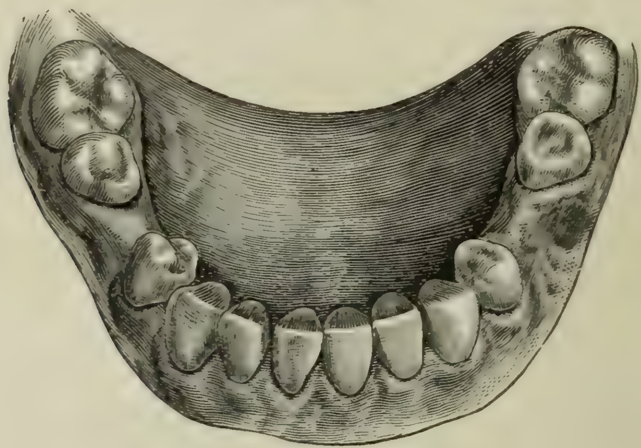
FIG. 36.

FIG. 37.

formations, assume the cone shape, and the centre frequently associated with this type of teeth. The coincidence in form between "Hutchinson" and malformed teeth and those of the chameleon demonstrates that tropho-neurotic change produces atavistic teeth. Fig. 38 illustrates the tendency of human bicuspids (when there is no antagonism) to rotate one-fourth round, thus again demonstrating the atavistic tendency towards the teeth of the chameleon. Fig. 39 exhibits extreme atavism; all teeth anterior to the molars are cone-shaped. The third molars are missing and would probably never erupt. In Fig. 40 appears more marked atavism. The upper and lower anterior are both cone-shaped and the superior first bicuspid exhibits a tendency thereto. The right superior second bicuspid, second and third molars, the right inferior first and second bicuspids, second and third molars are missing. The same condition probably exists on the left side. The space in the upper jaw is due to the insufficient width of the teeth. Alternation of teeth in

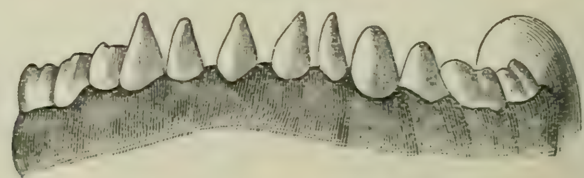
the upper and lower jaws is a reptilian feature. Fig. 30 furnishes an excellent illustration of the principles hereinbefore advanced.

Fig. 38.



In degenerate jaws the influence of the factors of the differentiation theory are also demonstrated. Every tooth in the jaw at

Fig. 39.



one point or another may display rudimentary cusps. On the incisors they are always to be found on the lingual surface.

Fig. 40.

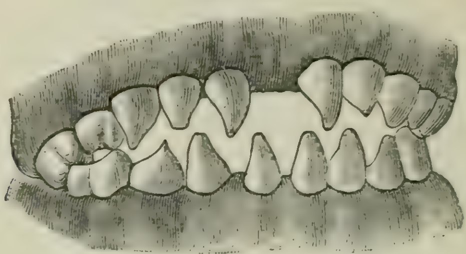


Fig. 41 illustrates the centrals with two rudimentary cusps, the laterals with one and the cuspids with one also. Fig. 42 represents cusps upon the lingual surfaces of the molars. The cuspids are not unlike the lower bicuspids with a rudimentary lingual cusp.

Thompson remarks that there is a gradation from central incisors towards the bicuspids in evolution. This grading of form is

not observed as we pass from the cuspid to the bicuspid in man. But we must remember that the cuspid often presents a cingulum

Fig. 41.

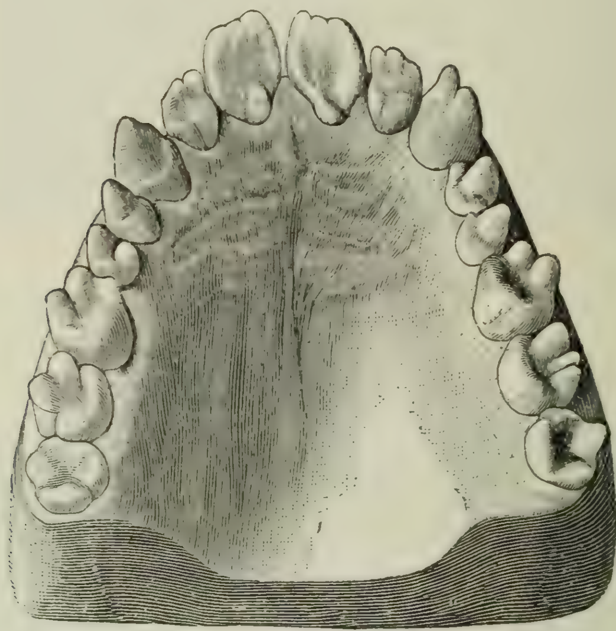
on the lingual face that inclines it towards the bicuspid forms in lower mammals, like the mole, and that the first premolar or

Fig. 42.

bicuspid is then more caniniform, the inner tubercle being much reduced. This inner tubercle is very variable and erratic as to

its position. It appears as far front as the centrals and is often present on the lingual face of the laterals of man. The lingual tubercle is very constant on the first bicuspid of man and is well developed as the buccal. But in some lower forms, as in the lemurs, it is quite deficient. It attains the highest development only in the anthropoids and man. Considering these stages of development, the grading from the cuspid to the bicuspid forms was more gradual in the earlier species than in the later, where the individual teeth have taken on special development.[1]

Fig. 43.



I have the skull of a degenerate girl who died from tuberculosis at thirteen years. Among other stigmata is a cusp on the external surface of a right inferior cuspid. This is a decidedly strong point in favor of the differentiation theory. Another strong point in favor of this theory is shown in Fig. 43, where every tooth is present and a most remarkable display of cusps occurs. The cusps upon the cutting and grinding edges are not obliterated. Commencing with the left superior central incisor three cusps are present with a rudimentary palatine cusp. The laterals also show three cusps, while the cuspid has two very distinct. The first and second bicuspids have tubercular cusps, they being in line. The buccal cusps upon the molars two to three and are still in position. The pala-

[1] Dental Cosmos, May, 1894.

tine cusps are worn away. The same is the case upon the opposite side except that the cuspid has cusps that have fused together, leaving a small projection upon the mesial side and a rudimentary palatine cusp. The cusp upon the third molar is lost. In another case (Fig. 25) the primitive cone teeth are seen trying to shape themselves into incisors. The lateral incisors, cuspids, and bicuspids are still cone-shaped. The first permanent molar is fairly formed, while the second molars are still in a primitive condition. Thus the points made by Osborn are nicely demonstrated in the two last illustrations,—namely, the triangular-shaped crowns and the levelling of cusps.

There is abundant evidence to show that degenerate teeth unite in twos, threes, fours, and fives, as indicated in the concrescent theory. These single cone-shaped teeth grow together and form bicuspids and molars. The germs of any two normal teeth may intermingle and unite; not only are the crowns found united with separate roots, but crowns and roots are united throughout.

Figs. 44 and 45 show two superior central and lateral incisors joined together throughout the entire length of crown and root;

Fig. 44.

Fig. 45.

Fig. 46.

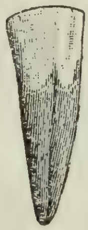


Fig. 47.

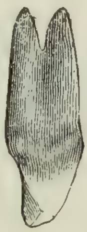


Fig. 48.

Fig. 46, two lower incisors are united throughout; Fig. 47 shows a cuspid with two roots; Dr. George T. Carpenter, of Chicago, has a right superior second bicuspid with three well-formed roots; Fig. 48 illustrates two bicuspids united at the crowns; Fig. 49 shows two molars perfectly united; Fig. 50 illustrates central and lateral incisors of the permanent set perfectly united; Fig. 51 shows two molars united; Fig. 52 a molar and supernumerary united, the supernumerary taking the cone shape with deformed centre. Fig. 53 shows three malformed teeth, each conated and completely united.

It is not uncommon to find three molars united together, as for instance the second, third, and supernumerary molar. Dr. C. V. Rosser, Atlanta, Georgia, has two small molars and a supernumerary cuspid perfectly united from crown to root, and these three further

united to the roots of a well-formed molar. Thus we see the concrescence theory is fully established.

That human jaws, like the human ears, are degenerating is a matter susceptible of demonstration by actual measurements. Mummery examined the skulls of two hundred Britons and Roman soldiers in Hythe church, Kent, England. He found the narrowest

Fig. 49.

Fig. 51.

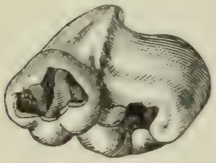
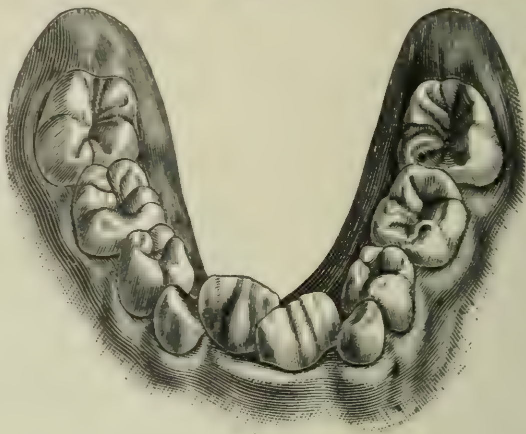


Fig. 50.



width 2.12 inches, the highest 2.62, with an average of 2.50. The width of jaws of four hundred and two British soldiers to-day is: narrowest 1.88, widest 2.63, average 2.28. The highest width was very rare, only eight measured 2.50. The jaws of the mound-

Fig. 52.

Fig. 53.

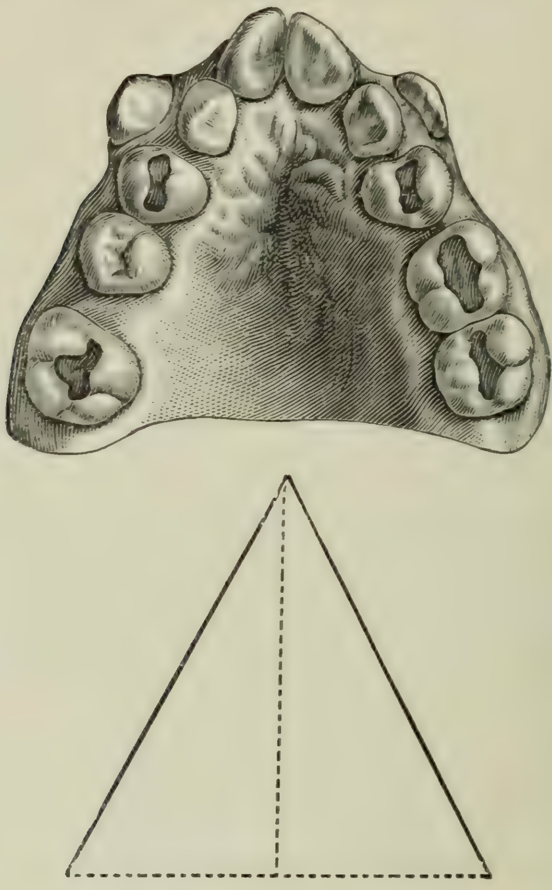
builders compared with the existing cliff-dwellers show similar results: the average width is about 2.50 inches. This is also true of nearly pure negro races. Measurements of normal jaws of eight hundred and fifty-five Italians of central Italy were, narrowest 1.88, widest 2.63, average 2.17. Measurements of normal jaws of four thousand nine hundred and thirty-five Americans gave the following results: narrowest 1.75, widest, only one case, 2.56, average 2.13. If in the highest type of physical man the width of the upper jaw from the outer surfaces of the first permanent molars near the gum margin was originally 2.50 inches in diameter, the

jaws of people now living in the same locality are from 0.25 to 0.33 inch smaller. Although the jaw has been growing smaller, since there are no breaks or deformities in the contour of the dental arch, this must be regarded simply as an adaptation to environment and not degeneracy in the proper sense of the term. The degeneracies of the jaws on which I would lay special stress are those in which deformity has resulted from inability to adjust structure to a changing environment. When arrest of development so takes place that deformities of the dental arch result, the jaws vary from two inches to one inch in width. As a rule, the teeth are the same size to-day they were three thousand years ago. This is due to the fact that their growth is antenatal and not influenced by postnatal systemic changes. The jaws do not contract as a result of mouth-breathing, that erroneous but favorite hypothesis with so many dentists and laryngologists. If the jaw can be arrested and be smaller in circumference than the teeth, a break takes place in the dental arch and deformity results. Two types of deformity occcur, the V-shaped arch and the saddle-arch. All other types of deformity not due to local causes are modifications of these two. These deformities always occur with the second teeth only. They are never seen before the sixth year, when the second set begin to erupt, and are complete with development of the second molars at twelve. They may become more exaggerated later in life from want of room, the eruption of third molar and want of harmony in relation of the two jaws when closed.

There are three characteristics of the normal arch. Independent of temperamental peculiarities the line extending from one cuspid to the other should be an arc of a circle, not an angle or straight line; the lines from the cuspids to the third molar should be straight, curving neither in nor out, the sides not approximating parallel lines. Absolute bilateral uniformity is not implied in this, as the two sides of the human jaw are rarely if ever wholly alike. A uniform arch necessitates a uniformity of development between the arch of the maxilla and the arch of the teeth and a correct position of the individual teeth in their relation to each other. When there is inharmony of development between the jaw and the teeth, as may happen when one parent has a small maxilla with correspondingly small teeth, and the other a large one with correspondingly large teeth, if the child inherits the jaw of one and the teeth of the other irregularities must follow. Such difference in diameter between the arch of the maxilla and that of the crowns of the teeth is a constitutional cause of irregularity. Whenever there is a

difference between these diameters the line formed by the teeth must either fall outside or within the arch of the maxilla and irregularities of arrangements result. The primary divisions of irregularities are the V-shaped and saddle-shaped arches. We have the V-shaped variety (Fig. 54)[1] (one of the typical forms), where

FIG. 54.



the apex of a triangle is formed by the incisors, the base of the triangle being a line connecting the two first molars. If, because of premature or tardy extraction, the first molar moves forward or the coincidence of the arch of the maxilla and the arch of the crowns of the teeth in trying to accommodate itself to the lesser arch of the maxilla, becomes a broken line forming an angle at the incisors. This angle results from two causes, the thinness of the process at this point and the diminutition of resistance which must follow.

[1] While the general outlines of the jaw and teeth are the same, in no two cases are they exactly alike. The cuts, therefore, are not drawn from actual cases, but are ideal diagrams of typical cases.

(To be continued.)

THE WORK OF JAMES EDMUND GARRETSON, A.M., M.D., D.D.S.[1]

BY H. H. BURCHARD, M.D., D.D.S.

Modern dentistry has lost another of its architects, oral surgery its founder, and stomatology one of its greatest forces in the death of Professor Garretson.

Entering the ranks of the dental fraternity when it was hovering on the border-land of the learned professions, he saw and seized the elements of greatness residing in it, and from then to the time of his death labored incessantly to endow dentistry with the dignity which he foresaw was to be its ultimate portion.

Beginning in 1859, he brought to the practice of surgery the training and knowledge of the well-equipped dentist, and how well he blended these two aspects of practice, and what he made from them, is seen in a stupendous work on regional surgery which has remained without a rival for twenty-five years.

It is in the last edition of this great work that the present culmination of stomatology is found; and the former editions exhibit the gradual evolution of a professional condition which began in toleration and has grown to a just recognition. Examining the works upon general surgery prior to the appearance of the first edition of the "Oral Surgery," it is seen the surgical armamentarium for use in the special field embraced by Dr. Garretson was of a type strongly suggestive of the Pompeiian relics in the museum of Naples; viewing it as he left it, we find an instrument cabinet replete with devices designed to expedite and render more humane many of the major operations of surgery, and a class of mechanism fitted for use in refined operations, the authorship of which is traceable to the learned gentleman whose death two professions mourn.

The secret of much of Dr. Garretson's success was not in genius, although he was endowed with genius, but resided in work; in an indomitable energy, a keen perception, and a rigid yet luminous reasoning which was brought to bear upon the problems confronting him. Beginning, as this systematic work did, with years of patient and assiduous labor in the anatomical laboratory, no work begun was ever relinquished until the master held within

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[1] Read before the Academy of Stomatology, January 26, 1897.

his grasp a clear, full, and philosophical comprehension of every factor involved. In any work engaging his attention he was the incarnation of energy, patience, and modesty.

These were the forces brought to bear upon a field of surgery ignored or half taught by the general surgeon and beyond the province or ken of the dental fraternity as it existed before this vivifying element touched it with the wand of possibility, and at times stung it with the lash of criticism.

Before his day stomatology was in an inchoate state. There was a field common to the general surgeon and medical practitioner and to the dentist; touched by all, embraced by none; treated by all, frequently cured by none, he had lived to see the fruition of much of his toil in the development of a new field of special surgery. His innate modesty never permitted him to assume his full measure of credit due him for the part he played in this evolution.

Reviewing his published works from 1863 to 1895, there is a history beginning in a perfect familiarity of the details of anatomy, normal and morbid, and of normal and perverted physiology, which, while keeping pace year by year with the great advances in each of these fields, year by year has been generalized into guiding principles; for the teaching of principles was the key-note to his professional life.

To him no such thing as an unrelated fact existed, each in his mind stood as representative of cause or effect, and through his long and honorable career in medicine every fact, datum, or phenomenon which his experience evolved, or which came under his notice, was carefully placed in its relations with others so that a continuous chain was formed. In his formulations there were and are matters which are seemingly not in perfect harmony with the details of the several sciences involved in medicine, yet it is readily seen that each is eminently fitted to subserve the purpose for which it was designed, to render clear to the minds of students problems which without such aid would be obscure or lead to mental confusion.

His method of teaching was purely inductive, and any means which could lead to the development of the inductive faculty in the students was applied, leaving to them the task and the acquired ability to deduce from general rules the details involved in them.

Under his touch the dry minutiæ of descriptive anatomy were clothed with alluring forms; the mind of the philosopher and poet endowing mere description with forms which chained and charmed the attention of the student. Facts and figures of biology had

woven about them such a skill of interpretation that even the laity saw beauty where before was felt aversion.

Pathology and morbid anatomy were painted in such colors that from repugnance grew an absorbing attention which surrounded even a malignant growth with an interest his listener never before dreamed.

Surgery, problems of medicine, aye, even those of the cosmos itself, were robbed of their complexity by the magic touch of this master and brought within the comprehension of even the novice. No man more than he possessed the power, invaluable in a teacher, of seizing and fastening the attention of his hearers to whatever subject he presented. Some apparently simple and yet profound truth, presented to an audience as an aphorism, drew a ready acquiescence from all, and from that basis, step by step, the subject-matter was unfolded in an orderly sequence as forcible as it was logical.

That phase of the oratorical power which sways through the reasoning faculty rather than by the force of rhetoric amounted in him to almost a genius in itself. While none of the graces of language which stamp the polished littérateur were wanting in him, he scorned the mere play upon euphonism and sophistry which lend polish to and rob force from the discourses of many orators.

The induction of principles from accepted facts was his work, and how well it has been done is attested in the professional lives of thousands, and the gratitude of all who have come within the range of his influence directly or indirectly.

For a specific example of his mode of thought we may take his division of neoplasms into but two classes, those having an explainable and those an unexplainable origin. This generalization has given rise to the opinion among some of his critics that he was wanting in appreciation of the details of pathological anatomy, and yet one of the last conversations I had with that learned philosopher was upon this subject, and he discoursed upon the origins and metamorphoses of tumors with such a profound knowledge of details as would disillusion the most carping critic.

His simplicity arose from repletion, not from lack of knowledge. This very formulation has given hundreds of pupils an insight into a matter who, without it, might have been led into gross misconceptions, and no doubt in some cases into fatal error.

This is but one example; his thousands of former students are familiar with a multitude of others, which have served as sound and ever-present guides to them, avoiding through their applica-

tion professional errors, and averting countless miseries to their patients.

One clinical teaching in particular is worthy of even more attention than it appears to have received, his method of operation for epithelioma. It was an axiom with him, that the greatest hope of cure in this malignant affection is in replacing the affected area by healthy tissue from another part, not the mere excision of the diseased structures. The records of his clinic show upon how sound a basis his opinion was formed. Not one fact amid the thousands he taught but was tabulated, classified to form part basis of some well-defined principle, and if a principle were already recognized was not placed in its proper relationship with its parent generalization.

His college chair reflected his mind; the other aspect of his teaching, his philosophical works, revealed the man himself. His philosophy was as near pure Platonism as any system could be and yet retain its distinctiveness. The Platonism of some two thousand years ago has speculation upon theoretic basis replaced by induction founded upon determined facts. Baconian lights are thrown upon Platonic pictures.

The Socratic method of exposition is applied throughout, and yet, contrary to the usual ending of a Platonic dialogue, definite answers to the problems discussed are presented.

There is not a school of philosophy from the Ionic to the Agnostic which has not been subjected to searching examination and criticism, and the results applied to an ethical code more than acceptable to Jew, Buddhist, Christian, or Mohammedan.

From the beaten track covered by all commentators he steps aside from the great mile-stones, Thales, Diogenes, Plato, Aristotle, Chrysippus, Epictetus, St. Augustine, Abelard, Averroës, Descartes, Bacon, Kant, Comte, and Spencer, to some almost forgotten thinker of the past, who has given one pearl, this Dr. Garretson has found with an unerring instinct and given it its proper position. To the contention of differing faculties, idealist and materialist, he gives his formulation,—" A thing is to the sense that uses it, what to that sense it seems to be."

For his personality, it was of such a type that those who knew him best loved him most. He represented the embodiment of all the reasons which caused the later Platonists to call Christianity Platonism.

Every trait of gentleness, affection, and a belief in the brother-

hood of mankind, which distinguishes the true Christian, resided in him, and found expression in acts of his life known to but himself and the beneficiaries.

A HIGH VOLTAGE CURRENT WILL STOP A THREATENED ALVEOLAR ABSCESS.

BY WILLIAM ROLLINS, BOSTON.

THE generator used was described in this journal for October, 1896, when it was recommended to dentists for use in benumbing the dentine. Electricians differ in regard to the voltage, one placing it at fifty-seven thousand, another at two hundred and fifty thousand. The ampèrage is equally indefinite. When tested before use it ran at a speed of fourteen hundred revolutions, and gave an apparently continuous stream through three-quarters of an inch of air. The patient held the negative terminal in his hand, the positive, covered with cotton, against the most painful place on the palate, which was opposite the apex of the root of the first molar. The feeling of intense cerebral congestion stopped in fifteen minutes; the severe pain in an hour. The gum which beat visibly like a heart became nearly normal. There was no return of the symptoms. In using high voltage currents the following method will prevent the patient from feeling the least sensation from the strongest current which the generator mentioned will give. In the armature circuit place a switch controlled by one of the feet. Have the current turned on the field. Have the patient hold both terminals in the proper positions. Then start the generator by closing the switch. When the sitting is finished open the switch before the patient drops the terminals.

ELECTRICAL IRRITATION OF FILLINGS.

BY DR. A. H. PORTER, PHILADELPHIA.

VOLTA's contact force and the chemical are the two rival theories that account for the electricity in a battery. To apply these to dental science, the inference from Volta's proposition is that filling and the tooth produce an electrical tension, and that any fluid existing in a crevice reduces the tension. The generally accepted chemical theory asserts that the fluid is both cause of the tension and release. Hence if Volta's be true and no crevice exist, an anæmic tooth is subject to a constant electrical pressure from a filling, which experience proves it will not withstand. Such a force in a stronger tooth will attract a larger blood-supply and build dense dentine.

Metallic fillings excite a greater electrical tension than cement.

Volta's position is reinforced by the well-known experiment of soldering metals and noting the opposite action of each on an electrified needle.

The Austen Roberts experiment is more recent: certain metals when solid diffuse into each other in time when in contact. Whether any dental author has pointed out the above distinction, the present writer has no knowledge. Dr. Palmer's electro-chemical theory draws attention chiefly to the destructive action of fluids electrically decomposed. The facts tend to show that positive electricity is nothing but force in matter of high intensity including light, and that negative electricity is nothing but force of low intensity including heat.

Both light and heat excite electro-magnetic vibration. As electricity ceases to be exhibited in a wire, light and heat appear, showing their identity with electricity.

Light, like positive electricity, discharges negative electricity.

X-ray pictures are taken by the (negative) waves (low vibrations) from a kerosene flame, magnets, ordinary anodes and cathodes, as well as Crookes's tubes.

The well-known experiment of a coin leaving its picture on a highly polished metal surface without pressure and by mere contact is through the same agency.

ANNUAL ADDRESS.[1]

BY DAVID W. CHEEVER, M.D., BOSTON.

Mr. President and Gentlemen,—It is rather to my shame that it can be said that this is my second visit to you, although you have done me the honor to give me membership for some years. It is, however, great pleasure for me to say a few words to-night, and possibly I might allude to a time—not very far distant—when I was still a teacher in the Harvard Medical School, and it was a part of my province to give some lectures on the surgery of the mouth, and to those lectures the members of the Dental School were requested to come. Some of you, I dare say, may remember that time, and some of you are, perhaps, of too recent date to have ever heard me say anything about it.

It was my earnest endeavor at that time to teach about the mouth those things which it seemed to me that every one ought to know who practised your profession, in order to guard against all sorts of ills both to yourselves and to the patients who fall into your hands. I endeavored to be particularly careful to discriminate between those things which were important in that part of the body and those things which were not important, and to show that it was of vital importance that the dentist should be able to recognize the early stages of certain diseased conditions of which he might warn his patients knowingly and understandingly in order that they might either correct their lives to prevent those affections or seek the advice of physicians and surgeons in order to have them treated.

I must say as I listened to Dr. Donald and his eloquent description of the charlatan in former years, who went about in a chariot and worked such destruction in the mouths of innocent people in the places he visited, that I felt myself a little twinge of remorse for what I had done in my earlier practice. In those days I extracted a great many teeth, and I am ashamed to say a great many teeth that ought to have been preserved. When I was younger and was one of the junior physicians of the Boston Dispensary, it was the duty of the physicians there to extract the teeth of every one who complained of toothache, and who said he wanted it done, without much discrimination as to whether it was really necessary.

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[1] Delivered at the Annual Meeting of the American Academy of Dental Science, Boston, November, 1896.

I make this confession in order to touch upon a point that I wish to make clear,—the very great change that has taken place through your means in the treatment of the teeth of the poor. The poor people who cannot go and have their teeth properly looked after and repaired at the time it is most needed were formerly entirely neglected, and it is due to your efforts and to your charity that clinics, so to speak, have been built up among the poor; that dental dispensaries have been established, where something may be done for the teeth of poor people besides having them pulled out the moment they ache.

Moreover,—and this is of greater importance perhaps, because it refers not only to the poor, but to many who are well-to-do,—your profession has done an incalculable amount of good by instructing people in the importance of proper care of the teeth. It is a familiar fact to physicians that many immigrants who come to our shores, some in the first and some in the second generation, begin to lose their teeth. The healthy immigrant from Ireland no sooner enters upon domestic service than she begins to lose her color, the character of the teeth become impaired, there is a gradual decline in health and strength, and they become a ready prey to all forms of disease. As a natural consequence, the next generation of those people are generally poorly provided with teeth and health and strength, and, this being the fact, anything that will tend to correct the conditions leading up to these results is not only so much gain to them, but probably also to their descendants in future years; and it seems to me that no more useful work is done to-day in Boston than that which you do in endeavoring to care for the teeth of the poor people, thereby supplementing and many times obviating the work of the physicians and surgeons at our hospitals. Through the charity of professional and philanthropic people, our hospital service is now so well arranged that the poor laborer who gets knocked over in the street and brought in with a fractured or dislocated limb receives, free of charge, more thorough care and treatment than he would in his own home; and perhaps as high medical and surgical skill as can be obtained anywhere by the millionaire, and anywhere in the United States. And it is in the same line with this class of work that your infirmary service belongs, which enables the infirmary patient also to enjoy privileges fully as important to the health and comfort of the individual.

I will allude again, but only for a moment, to the fact which your orator called your attention to,—the interest which your profession must have felt in the late celebration of the fiftieth an-

niversary of the first public use of an anæsthetic for the prevention of pain; and I shall not attempt to emphasize how prominently it must have appeared that the practical demonstration of the fact that anæsthesia could be so used that severe surgical operations could be borne without pain, was made by one of your profession; and for this we certainly owe you a debt of gratitude.

Now with regard to the future. It seems to me that two great problems present themselves to you in the matter of the care and preservation of the teeth of the entire community,—two special fields towards which you ought to devote your energies, your industry, your most careful thought and investigation. The first of these is, that you instruct your patients with regard to the proper selection of articles of food and diet which will tend to preserve the teeth. Many of us think that since the wheat was bolted into flour there has been a loss of bone-forming qualities, a loss of phosphates, which is entailed by the process of bolting. We think we find abundant proof of this in the change which can be noticed in the teeth and the general health of the Irish and Scotch immigrants after they have lived a few years in this country. Their food in the old countries consisted mainly of oatmeal and the cereals and articles of food made from coarse grains, which they promptly neglect when they get here, seeking always the finest wheaten flour, which they do not always properly masticate, but succeed in swallowing by the aid of large quantities of tea. To the fine white flour and to the teapot, I believe, must be ascribed the various disorders of the system, the conditions of chronic indigestion and dyspepsia, into which a great many of these young women pass.

The other point that I had in mind is a matter which is yet in the infancy of its progress, and that is the study of bacteriology in order that we may contend with those very numerous microbes or parasites which are the concomitants or probably the causes of the decay of the teeth. It seems to me that with the microscope and with the various germicides which are coming into use there is a great field open to you, the earnest study of which will have an important bearing on the preservation of teeth from decay.

To sum up these points briefly, then, they are: first, that people must be instructed with regard to the kind of food which is best not only for their teeth, but for their general health as well; and, second, that in the study of bacteria, you will learn how to oppose and prevent their growth and stop the consequent destruction of the teeth.

Abstracts and Translations.

THE DECAY OF THE TEETH.[1]

If the story told us by the prehistoric remains in our museums is to be relied upon, we may be sure that decay in human teeth has existed as long as the race itself. From the earliest crania we see evidences of carious teeth, and we may consider it to have been as extensive as most human ills. At the present time decay is perhaps as prevalent as ever before, caused mainly by the unnatural manner of living. Luxuries, mixed and adulterated foods, containing starch and sugar in excess, have much to do with it, for they are the principal ferment producers. The acids formed by these ferments decalcify the tooth structure, thus giving entrance to organisms, always present in the mouth, and these continue the work of destruction. The various views concerning the nature of decay of the teeth have undergone manifold changes in the course of the centuries which have elapsed, and it has waited for this,—the era of bacteriological investigation,—which has given to us facts, that makes its nature visible to all. So far back as the time of Hippocrates (450 B.C.) it is stated that the cause of decay was probably "the bad juices caused by stagnation." Galen and others state that trouble with food, lack of nourishment, makes the teeth weaker, and also say that the excess of food makes a sort of combustion, which causes decay. Then we had the inflammation theory, according to which, by means of an inflammatory process, first the lime salts of the tooth are dissolved and then the remaining basis substance liquefied. Such a theory is even to-day defended by some writers, in spite of the fact that the results of more recent investigators show it to be untenable. This theory is sheer nonsense, for there are, in every inflammation, elements which do not appear in the decaying process of tooth-tissue, and the cardinal symptoms of inflammation are not observed in dental decay. The causes and materials which always cause inflammation will not produce it in the

[1] A condensed report of a paper written by Professor Jung, of the University of Berlin, the translation by Samuel C. Prescott, of Cambridge, Mass. Prepared and read by request before the Harvard Odontological Society by R. R. Andrews, D.D.S., Cambridge, Mass.

matrix substance of the dentine, and then decay takes place in dead teeth as well as in living ones. Inflammation is a vital process. It can only be considered in living tissue. One can produce artificial decay in dead teeth, even outside the mouth, differing in no way from the natural decay, and this is a proof that external agents alone, without vital reaction of the tissues, are enabled to produce the complex symptoms of the disease. Representatives of the inflammation theory to-day are Heitzmann and Bödecker. They claim to have microscopically proved that a genuine inflammation of the dentine of the tooth is present very extensively even in places which have no connection with the tooth-pulp or the pericementum. Through the inflammation the lime salts are dissolved, and the matrix or basis substance of the dentine liquefies, and there results a cavity, which may be filled with "medullary corpuscles;" if these latter fall to pieces, there results an abscess in the root of the tooth. If they take up lime salts again, then a *restitutio ad integrum* takes place. It is strange that these pictures which Heitzmann and Bödecker have seen and also drawn could be confirmed by none of the many investigators of the decay of the teeth up to the present time. Another theory of decay we may call the worm theory, according to which small worms might destroy (devour) the substance of the teeth. This view was for a long time the current one among the earliest writers. Then there was the fermentation theory. Remnants of food fermenting between the teeth cause the teeth themselves to ferment, but it has been proven that the alkaline products of fermentation cannot attack a tooth. Then there was the chemical theory. This has followers, who consider that decay takes place as a result of inorganic acids, and those who consider organic acids as the cause of destruction of the tooth-tissue. But such inorganic acids are not present in the mouth. Organic acids, however, will destroy the teeth, so that macroscopically we are presented with a picture similar to the real decay, but which, by microscopical research, appears entirely different. The chemical theory is one which has obtained longest, even up to recent times. Thus, Magitot, Wedl, Tomes, Taft, Schlenker, and Baume, among the authors of the last three decades, were late followers of this theory. The chief part of the decomposition, besides that of the acids brought into the mouth in food and drink, is ascribed to the acid mucus and saliva, especially by digestive disturbances, wasted secretions, acid decomposition products, etc. Another theory was the parasitic theory, according to which parasites may be promoters of decay. Thus were Leeuwenhoek's "animalcula" ac-

cused in this direction (not by Leeuwenhoek himself, however). Erdl found a "parasitic vegetable;" Ficinus, infusoria, which he designated by the genus name of "denticola;" Klencke, his "zahnthierchen." The parasitic theory gained many advocates by the publication of the researches of Leber and Rottenstein. To leptothrix buccalis these authors conferred a particularly active *rôle* in the work of decomposition. The "elements" of the fungi present in every oral cavity multiply in the small tooth-canals in vast numbers, distending them, and thereby affording an entrance of acid into the depths, thus leading to the decomposition of the tissues. Indeed, it was believed that this fungus itself could bore through enamel, separate its prisms from one another, and then break it to pieces. The new theory was not at first generally accepted. It has continually gained ground, and has done much to prepare the way for the chemico-parasitic theory of Miller. Another theory was the electrolytic theory. In this the crowns of the teeth were electro-positive (Bridgman, Chase, and others); the dentine, electro-negative; and this, by the addition of moisture, produces an electrolytic dissociation of the mouth fluids, and the acids separated would result in decalcifying the tooth at the positive poles (the crowns). Since the tooth-tissues are non-conductors this theory is not at all tenable, as for the generation of an electric current both excitants must be conductors. There were various other factors given as causes of decay,—mechanical injuries, fissures resulting from change of temperature, acid foods, excessive use of sugar, etc.,—until the researches of Miller and his chemical parasitic theory brought to us the light and truth. Miller gives the results of his researches in the following statements: The decay of the teeth is a chemico-parasitic process, consisting of two significantly marked steps,—the decalcifying or softening of the tissues and the dissolving of the softened residue. The decalcification of the enamel means the total destruction of it. The source of the acids necessary for the softening of the tissue is not difficult to determine; they are the remnants of food containing starch and sugar retained in the cavities (fissures in the enamel, narrow cracks between the teeth, etc.), and which by fermentation form acids. The second step—the dissolving of the softened tooth-substance—is accomplished by fungi always found there. We have seen that many of the mouth fungi possess the power of dissolving or peptonizing albumen or albuminoid substances,—*i.e.*, to change them into a soluble modification. We know that the dentine matrix consists of an albuminoid substance. Thus we have the explanation of the second step of tooth

caries, especially as solution of the decalcified dentine by fungi may be directly proved and experimentally observed. Consequently, Miller lays special stress on the action of ferment acids arising in the cavity, while hitherto only the acids brought in from without have been regarded as active in the process of decalcification.

Miller's theory is to-day recognized by the great majority of all authorities on dental science. There are only a few who believe in the theories of the last decade who uphold the formerly current combustion theory of the pure chemical theory, and who contest the work of Miller under the assumption that the presence of micro-organisms was purely accidental and had nothing whatever to do with the disease itself. Thus, Baume, especially in the newer editions of his "Lehrbuch," holds to the opinion that the fungi might luxuriate in the tissue undergoing destruction in the manner in which fungus elements luxuriate in decaying tissues. The bacterial fungi must be, therefore, the result of caries. Baume assumes four steps in caries: 1, the dentine becomes transparent; 2, turbidity of the transparent dentine, as the result of softening; 3, formation of pigment and great softening; 4, cartilaginous dissolving and destruction. He states that only in the fourth step are fungi present.

As an advocate of the pure chemical theory, Baume seeks to prove that the acids alone may be sufficient to carry on the work of destruction; in reality the characteristic microscopical changes in activity in caries cannot be explained as derived from the action of such acids. The picture under the microscope makes the presence of micro organisms absolutely necessary.

It may be proper to consider these changes at some length. There is observed in the enamel at the places where caries is taking place, first a roughness; the enamel has a whitish, cloudy appearance; further, a softening of the enamel follows, and accompanying this complete disappearance of the same. It is decomposed to a white powder and a cavity results, the edge of which is more or less colored brown. In general this decomposition of enamel goes on comparatively slowly up to the point when its whole thickness is destroyed, even to the dentine. In the dentine the process goes on more readily and also expands laterally, and, as a result, the enamel is attacked from the inside and broken down. The dentine is not like the enamel. It is not entirely destroyed by the decalcification, but there remains behind a cartilaginous mass,—the decalcified basis-substance of the dentine (tooth cartilage). According to the rapidity with which the carious process continues, the part

attacked takes on a diversified coloration (pigmentation),—that is, it remains white in the rapid form, but is light brown or black when the process has a more or less pronounced chronic course.

Microscopically, we see only the coloration of the edge in the enamel. In the dentine the canals appear greatly distended and filled with fungus matter, micrococci, bacilli, etc.; in some cases a solution of the substance between the canals takes place, whereby neighboring canals fuse with each other, and thus numerous small cavities result, which, merging into each other, soon settles the destruction of the tissue. The deeper layers of the decalcified tooth bone (dentine) are not so full of bacteria; they are only seen here and there, so we may assume that the entrance of these proceeds with the dissolving of the tissues.

The decalcifying can naturally be accomplished by acids only, and on this account we may designate the decalcification as the first and the entrance of bacteria as the second step in caries. Caries of the cement-substance sometimes takes place on exposed roots, and then appears as a softening of the tissues and subsequent cavities, which are found to be mostly without distinct edge or great depth. The decalcification and solution then goes on as in dentine. The canals of the cement become infiltrated with bacteria and broadened, especially the fibres of Sharpey and the cement lacunæ. The course of decay beyond this point is the same as with dentine,—that is, after the disappearance of the walls of the canals the cavities join, a greater cavity results, and the dissolution of the tissue is made complete.

According to Miller the following are observed only as accompanying phenomena in caries: the transparency and pigmentation of the dentine, phenomena which have been earlier observed as characteristic of caries. (Baume and others.) If one looks at a section of a tooth in which caries is present in the first stages, he will see a conical transparent part in the dentine whose apex extends in the direction of the canals nearly to the pulp, while the base of the carious place lies on the surface. This transparent zone of dentine is not observed in dead teeth. It is present without the phenomena of caries in parts of the dentine upon which a chronic irritation exists, as, for example, the cutting surfaces that become deeply worn are subject to an irritation of a chemical or thermal nature to the pulp, and, as a result, we find there has been formed a transparent zone. Such a transparent zone sometimes appears in the dentine of the root. We must, therefore, conceive the transparency to be a vital process, by which, in consequence of

an external irritation (especially acids), the tooth-canals in the dentine are induced to an increased laying up of lime salts, so that as the outer surface of the canals change (calcified) these become narrower and the lumen of the canal is lessened. (Miller.) Under these conditions the dentine becomes more uniform, since it now consists only of hard tissues and not, as in the normal condition of hard and soft tissues, alternating with one another. The homogeneity necessitates another index refraction of the light rays: hence the transparent zone.

The views concerning the nature of this phenomenon are still somewhat unsettled. While Tomes, Magitot, Walkhoff, and others stand out for the assumption of a partial calcification of the dentine canals, it is doubted by Wedl and others. Leber and Rottenstein, as well as Schlenker, seek the transparency in a partial decalcification of the dentine. According to Baume, it is produced by an obliteration of the canals, which may be caused by growth of basis-substance (dentine matrix). Wellauer puts forth the view that the transparency consists of a partial withdrawal of the lime contents of the matrix, either through periodical infiltration of the dentine canals with lime salts in solution, or by partial or complete calcification of the contents of the canals.

According to the views of some writers (Black, etc.), the pigmentation of carious tissue may be caused by the action of sulphur compounds, which may be formed by fermentation processes; according to others, by direct coloring substances, as coffee, tobacco, etc. Pigment-forming bacteria are also accused in this direction. We may accept Miller's view that bacterial processes play the principal part here; as every other organic substance which is decomposed by bacteria in course of time assumes a dark color, the tooth-tissue does the same. The processes are supported by oxidation processes, for which the oxygen of the air is ready for disposition in plentiful amounts. Pigmentation always takes place also in sound dentine if this is exposed. We see it in the wearing away of the enamel on the grinding surfaces. The question now arises, Of what nature are the bacteria of caries? After Leber and Rottenstein the chief advocates of leptothrix buccalis, Clark, Underwood, and Milles, have been engaged with the study of these organisms. Clark describes his dental bacteria, which he found in carious teeth, as follows: They can easily be confounded with the vibrio regula or with the forms described by Cohn under the genus name of Spirochætæ or with spirochætæ plicatilis; they have a hardly noticeable screw-like motion and,

I believe, various forms. Their activity is heightened by the addition of acid. Without this they appear sleepy and lifeless. They are found nowhere in sound dentine, but sometimes in the deposit on the teeth. Vibrio regula and spirochætæ plicatilis, on the other hand, are never found in the canals of the carious teeth, which circumstance alone separates the dental bacteria from both these kinds. Miller could not confirm the results of Clark. He wrote concerning them: I have not found in the dentine canals the bacteria described by Clark, to which he ascribes the leading part in caries. This form occurs especially on the tooth and not in the cavities. The vibrios cannot exist in the canals. Underwood and Milles reported in 1881 that they had found various forms of micro-organisms, especially micrococci, small rod forms, and oval bacteria, short bacilli present in carious dentine; so, like the other inquirers of that time, they confined themselves to proving views concerning the nature of the micro-organisms involved by microscopical examination of the fungus masses contained in the dentine canals. Miller opposed the theory of leptothrix buccalis by the theory of a specific micro-organism of the mouth cavity which might produce all other diseases besides caries. He proved that the formations which Hallier, and after him others, had accepted as elements of leptothrix buccalis, which was represented as a fungus, could not exist in connection with this bacterium; that what had been considered as swarmspores of leptothrix buccalis, motile fission fungi of certain kinds, and that which had appeared as swarmspores in the resting stage, were cocci, as they are present in the mouth cavity in manifold forms.

It appeared that the iodine reaction described by Leber and Rottenstein could not be considered as characteristic of leptothrix, since Miller could prove that a variety of kinds of filiform fungi are present in the mouth, which show a beautiful violet color with iodine and acids, and, moreover, that these filiform fungi, which give the iodine reaction, are quite clear and regularly jointed, while leptothrix is described as thin, long, unjointed threads.

The leptothrix appears to play only a secondary part in caries, according to the pre-ent ideas, since growth of leptothrix appears only on the layers of carious dentine nearest the surface (mostly decomposing), while the threads are not met with in deeper layers. From the deeper layers of carious dentine Miller was able (in 1880) to isolate five kinds of bacteria, to which, in view of the place where they were found, a close primary relation to carious processes could be ascribed. The first of these forms that he found were cocci and

diplococci, found either simply or in chains; the second has several forms,—cocci, bacteria, bacilli, and threads. The third form, very small abundant irregular cocci, seldom joined in chains. The fourth also occurs in the form of cocci, which show an extraordinary diversity of size. The fifth is morphologically most interesting of all. It occurs in short rods, with all variations from straight to semicircular; it is also found joined in twos, forming a small S; also as threads, but more or less like spirilla, jointed or unjointed. All these kinds seem to have the general property to set in fermentation solutions of fermentable carbohydrates, whereby lactic acid is produced; and this acid has a very strong affinity for the lime in tooth-tissues.

By combination of the results which Miller has obtained concerning the properties of these five caries fungi and some twenty other mouth bacteria, he has formulated his view of the subject of the activity of these forms in regard to caries. Of the twenty-five kinds, sixteen were proved as able to form acids by fermentation of the carbohydrates. These might, therefore, come into the consideration of the first step in caries. The majority of all showed peptonizing qualities, which they would be able to use to dissolve the decalcified dentine and cement. Only those were considered as caries bacteria which were proved active in carious dentine.

After Miller, Gallippe and Vignal have been engaged to some extent with the study of caries bacteria, and they succeeded in isolating six different kinds. Four of these occurred in all the eighteen teeth investigated, one kind only eight times, and one only five times. Like Miller, Galippe and Vignal had in their studies used only gelatin beside the liquid media in studying the life history of these organisms. More recently Professor Jung, of the University of Berlin, carried the experiments further by using solid media, which permitted treatment at the temperature of the mouth cavity.

Investigating in this way with seventy-two teeth, Professor Jung succeeded in isolating ten different kinds of bacteria from carious dentine. Besides these ten kinds, an eleventh was found; however, not constantly, and he is not sure that it is an active caries fungus. There were always several kinds present in carious dentine at the same time, and we may consider it as settled that the decay of teeth is not due to a specific bacterium, but to a mixture of infection.

In dead teeth caries takes place with exactly the same phenom-

ena as in living teeth. Caries may also be produced in artificial ways, differing in no way from the genuine caries.

Miller has proved that the phenomena of caries in animals are exactly like those in the human teeth.

There are only a few now who do not believe in Miller's theory. All recent authorities are working after Miller's ideas, and we may assume that questions concerning the nature of decay of the teeth have now found their final solution. There are other secondary phenomena, as revealed by accurate microscopical examination of carious teeth, that await a satisfactory explanation, as, for instance, the thickening of the so-called Neumann's sheaths, the appearance of the so-called pipe-stem formations, and the presence of granular elements (not vegetable) in the canals of the dentine.

The thickening of the so-called Neumann's sheaths in decayed dentine may, according to Neumann's assertion, often be so complete that the lumen may entirely disappear. Tomes allows only a partial obliteration, and Leber and Rottenstein dispute this, although they do not know how to maintain the fixed facts in regard to the thickening of the walls. Miller explains the phenomenon by the pressure of the collected bacteria masses in the canals, by means of which a compression of the wall-sheaths is brought about. That it cannot deal with vital processes is made clear from the circumstance that the phenomenon is also observed in dead teeth.

The presence of rows of shining irregular globules in the canals of carious dentine in early stages is considered by many as a vital phenomenon,—an attempt of the pulp to oppose the progress of caries. The facts opposed to this are the appearance also observed in dead teeth. Tomes, Magitot, and others considered the formation as lime granules; Wedl, Black, and others as fat drops. The investigation leaves the field still open. Something not yet understood is the question relating to the so-called healing of caries, that rare phenomenon in which the decaying process comes to a stand-still, and the carious, weakened dentine becomes hard again without any addition.

These are the facts about the primal causes of dental decay. The question, "What are the predisposing causes?" yet remains to be answered, and it is a field for much thought. It is not wholly hereditary, or faulty formation, that causes the dentine to become a culture medium for the fungi of the mouth. We know there are constitutional factors at work, retarding the healthy natural vigor of the system, weakening the dental tissues as well. Women about to become mothers, people attacked by constitutional disease, over-

worked students in our schools and colleges, all these suffer much at such times from decaying teeth. A return to health retards and will sometimes stay the trouble. Are we not all familiar with a class of patients that have had a fine set of teeth up to the fiftieth or sixtieth year, who suddenly find their teeth troubling them and rapidly decaying? In such cases, in my own experience, and I remember several, it seemed impossible to arrest the trouble, and in two cases death followed in a short time. Impaired vitality from whatever cause has a very marked effect on the dentine, and under its influence it rapidly becomes a culture medium in which the caries fungi thrive; on the other hand, the exposure of the dentine from wear or from a break does not always end in decay. In health and vigor decay may become arrested by a natural process. Miller's work is a grand one, but we have much yet to learn. I shall invite your attention now to the lantern exhibit, where we shall see the dental tissues in health and in decay.

Reports of Society Meetings.

AMERICAN DENTAL ASSOCIATION.

(Continued from page 119.)

August 6, 1896.—Third Day.—Afternoon Session.

The meeting was called to order at five o'clock, the President, Dr. John Y. Crawford, occupying the chair.

The minutes of the previous session were read and approved.

Dr. Peirce.—It is the duty of the Executive Committee to make a report regarding places for meeting next year. This duty devolves upon the section of which I am chairman. I hold in my hand papers sent here from Denver, Colorado, inviting this Association to meet there next year. I have first to present to you a petition signed by seventy dentists, offering every opportunity that the profession could ask for holding a successful convention. I have also a petition from the hotels, offering rooms and the best of service that can be had at from three to five dollars per day. I have a lengthy communication from the Chamber of Commerce, begging us to accept the courtesies of the city, and offering every

possible opportunity for comfort and success; also from the mayor of the city and from the governor of the State. The business men have also sent a petition, and the railroads say they think they can carry people from the East to Denver for about sixty dollars, the price of one fare. I am told that the nights there are always cool, and that it could not possibly be as hot as here. The mountains are close by, and any one finding the city too warm can go to the mountains.

I am also asked by the committee to request you to meet at Old Point Comfort. The Southern Dental Association have selected Old Point Comfort, and they desire us to meet at the same time, hoping some combination can be made.

Washington and Niagara Falls have also been mentioned, but I trust some one interested in the union of the societies will take the floor and state the advantages of meeting at Old Point Comfort.

Dr. Fillebrown.—Two years ago this committee was appointed to invite the Southern Dental Association to appoint a similar committee to confer in regard to the combination of the two societies. Last October the Southern Dental Association responded to our invitation and appointed a committee of five members. Aside from that, at the last annual meeting held at Asheville, North Carolina, on July 28, they voted to continue that committee and to further consider the matter, and to report finally at a subsequent meeting, and they also voted to meet at Old Point Comfort, with the idea that it would be convenient for the American Dental Association to meet there with them, and expressed formally the desire to have us meet there. We were the hosts in the beginning, and invited them, through the action of the committee, to do what they did. They have fixed Old Point Comfort, and they would have invited us to meet there, but the idea was expressed that that Association had no especial right to invite this Association to meet on the soil of Virginia when they were an Association that was meeting in Asheville, North Carolina. They want us to consider the subject, and every man, I think, hopes it may be brought about. The Hygeia Hotel has placed in the hall we occupy a system of electric fans, which makes the place comfortably cool. There is also a new hotel which is very fine in its appointments, and there is an old hotel which has been renovated, the charges to be two dollars a day. At the Hygeia it will be about two dollars and fifty cents. Four dollars a day is the regular rate at the Chamberlain, but they would do a little better for us.

Dr. Morrison.—I would like to ask if the committee has not

discretionary power as to meeting either at Old Point Comfort or any place that may be selected by the Association. My understanding was that there was some discretionary power granted to call the Southern Dental Association to meet wherever we meet next year.

Dr. Richards.—The action of the society, as I understand it, was that they were to meet substantially as set before you by Dr. Fillebrown, hoping that this Association would meet them at that point. Our society is of course subject to the action of its Executive Committee. The chairman, I believe, is present,—Dr. Clifton, of Texas. I do not remember any motion to the effect of changing from that point to any other. We, unfortunately, in the past year or two, have been going about somewhat, and it seems to me, as far as I remember, that no provision was made for any other place, thinking that Old Point Comfort would suit all parties better than any other we might select.

Dr. Moore.—Before coming here I had not learned of the meeting of the Southern Dental Association at Old Point Comfort. Knowing the matter of the union of the two societies had been talked over by the committee, and it was hoped it might be consummated next year, after consultation with a number of gentlemen from different sections of the country, I wrote Mr. Pike, the proprietor of the Hygeia Hotel, asking him if he could accommodate us next year, and at what rate he would give us board, and if he could give us all the accommodations we would need in the way of rooms for meeting purposes, committee-rooms, etc., for the Association of Faculties and the Board of Examiners, and asked him if he wanted us to come to telegraph me. He answered yesterday, and said he would make the necessary arrangements, and give us accommodations for two dollars and fifty cents per day. His regular rates are higher than that. Some of the gentlemen proposed that I should telegraph to the proprietor of the Chamberlain, which is one of the finest hotels in the South. Their regular rates are four dollars per day. I have authority from the Virginia State Society to invite this Association to come to Old Point Comfort.

Dr. Morrison.—I want to second the nomination of Denver as the place of meeting, from the fact that it is a little east of the geographical centre of this country, and the Eastern division of the country is having a little more of the benefits of the Association than any other portion of the country. The West is entitled to a little more representation, and I can assure you, from my knowledge of the people of Denvĕr, that you will be well enter-

tained, and it will be a revelation for the Eastern gentlemen to pay a visit to that beautiful city at the foot of the Rockies.

Dr. Rhein.—I want to nominate a place for the next meeting of this Association, and in doing so I would say, if I thought there was any possibility of a successful consolidation of this Association with the Southern Dental Association, I would gladly support the movement to meet at Old Point Comfort; but I do not believe, from all I have learned, that the majority of the Southern members are willing to give up their Association. Their remarks in that direction at Atlanta show that the majority of them felt that way. We all have had, I believe, by mail, an invitation to hold our next meeting in California, and I am thoroughly in favor of taking the next meeting there. I see no reason why we should stop at Denver. It is about time we went West. We have talked about it for years. Therefore I nominate the city of San Francisco for the next meeting.

Dr. Mason.—I think if the gentleman had ever ridden from Denver to San Francisco in the train he would not care to take the ride again very soon.

Dr. Molyneaux.—I second the nomination made to go to Old Point Comfort for the very reason that we never know what we can accomplish until we try. It seems to me if there is a sentiment of antagonism to this idea of joining forces with the Southern Dental Association, if we meet these people half-way, they will change their feeling, and we will unite in one grand society. Therefore while we have been there but recently, I feel like seconding the nomination that we go there again, and see if we cannot further this matter.

Dr. Davis, of Chicago.—I rise to second the nomination for Denver, for exactly the same reasons that the gentleman has already seconded the nomination for Old Point Comfort. When we met in Minnesota our membership was five hundred or more, and now it is only about two hundred. It has been shown from the two meetings held in the West that the West is the place to get the membership. If we do not meet West, the chances are that we will have a Western Dental Association, and I think in seconding the nomination for Denver that the Californians will feel that they have an interest and a chance to meet with us. It is as near the centre of the two points as it can be, and is central for all parties. If the Southern Dental Association want to affiliate with the American Dental Association, I see no reason why they should not meet in Denver.

Dr. Templeton.—I move that the nominations close.

Drs. McKellops and Molyneaux were appointed as tellers.

Sixty-nine votes were cast, of which Old Point Comfort received 45; Denver, 17; San Francisco, 1; Niagara Falls 5; Norfolk, 1.

ELECTION OF OFFICERS.

Dr. Cushing moved that the first ballot be an informal or nominating ballot. If upon the second ballot there should be no choice of names, the highest three shall be taken, and at each subsequent ballot the name having the smallest number of votes shall be dropped, this rule to apply to all the nominations.

Motion carried.

The balloting resulted as follows:

For President.—Fifty-seven votes were cast, of which Dr. Truman received 32; Dr. Fillebrown, 17; Dr. Watkins, 2; Dr. McManus, 3; Dr. Hunt, 1; Dr. Clifton, 1; Dr. Templeton, 1.

A motion was made to make this ballot a formal one.

Motion carried.

For Vice-President.—Fifty votes were cast, of which Dr. Fillebrown received 40; Dr. Watkins, 3; Dr. Clifton, 4; Dr. H. A. Smith, 1; Dr. Morrison, 1; Dr. D. Holly Smith, 1.

A motion was made to declare the ballot a formal one.

Motion carried.

Second Vice-President.—Forty-four votes were cast, of which Dr. Clifton, of Waco, Texas, received 33; Dr. Watkins, 1; Dr. Morrison, 8; Dr. Hunt, 1; Dr. Richards, 1.

Motion made to make the ballot a formal one.

Motion carried.

Dr. Peirce moved that the President cast one vote for Dr. Cushing for Recording Secretary.

Motion carried.

The same motion was made in reference to the Corresponding Secretary, and Dr. Emma Eames Chase was re-elected.

The Treasurer, Dr. Morgan, of Nashville, Tennessee, was also re-elected in the same manner.

The next order of business was the election of three members of the Executive Committee in place of Drs. W. W. Walker, D. N. McElhenny, and S. G. Perry.

Upon a ballot being taken, Dr. Perry received 38 votes; Walker, 26; and A. O. Hunt, 29.

A motion was made to make the ballot a formal one.

Motion carried.

Dr. Boice.—I have a resolution that I would like to offer:

"Resolved, That our Recording Secretary have printed a list of members, with their addresses; also a list of the members of the sections, and send the same to each member on or before November 1, 1896."

Resolution adopted.

The chairman of Section I. requested the privilege of drawing upon the Treasurer for one hundred dollars, as he had some plans for the improvement of the section. The matter was referred to the Executive Committee.

A vote of thanks was offered to the proprietor of the Grand Union Hotel for the courtesies shown to the Association.

Drs. Richards and Gaylord were appointed to conduct the newly-elected President to the chair.

Dr. Crawford.—Permit me to return to you my sincere thanks for the uniform courtesy and confidence you have extended to me during the last two years of your history. It now affords me pleasure to welcome to this platform a gentleman so distinguished in the learning of our profession, and not only in that, but all of its collateral sciences,—not only distinguished in these departments, but also as a teacher and an educator, and one whom I have no doubt will preside over this society with much honor.

Dr. Truman.—Permit me to thank you most sincerely for this high honor, entirely unexpected when I entered this hall in the earlier portion of this week. No idea of being President of this Association entered my mind. I am satisfied that it was done without any political influence, and as I hold and have ever held that the place must seek the man, and not the man the place, I accept it with satisfaction, and, as I said before, with thanks.

It seems to me that there is something to be done by this American Dental Association to overcome the apathy which has hovered like a cloud over it for several years past. We all love this body; we want to see it energetic and moving in proper lines towards higher things; and the only way to accomplish that is through enthusiastic efforts. It seemed to me last year, when we met at Asbury Park, that the system was defective which permitted a large number of papers to be read by title. It is always discouraging to a man to have his paper disposed of in this way. What has been the result? We have had a paucity of papers this year, and while, to me, the forepart of this meeting was the most satisfactory of any I have attended, I cannot speak so of the latter part, because both mechanical and operative branches were almost

entirely ignored. We have many men of different minds in our Association, and we must cater to all shades of thought. Therefore I hope that during the next year, and in the early part of the year, there will be an effort made to bring out all the sections in full force. For myself, I cannot be at the head of anything that seems to be in a dying condition. I know by proper energy this Association can be brought up to full fruition.

I do not wish to detain you to-day. It is growing late, and I am satisfied when we come to meet at Old Point Comfort the hope of many years of my later life will be accomplished, and we will join hands with our Southern brethren and come up as one body to carry on this great work in the future.

The chair appointed as a local committee for the ensuing year, Drs. J. Hall Moore and T. H. Parramore.

Dr. Crawford.—I would like to say a word. We have done the proper thing in re-electing our Corresponding Secretary. I want to call the Executive Committee's attention to her efficiency in this work. She used her influence in corresponding with the local societies, in providing blanks at the proper time, in advance of the meeting of the State societies, in order that the applications might come in in due form. I want to say this word of commendation for her willingness and her efficiency to do that work.

The chair appointed Drs. E. T. Darby and A. W. Harlan on the Publication Committee.

The final reading of the minutes then took place, after which the Association adjourned to meet at Old Point Comfort on the first Tuesday of August, 1897.

ACADEMY OF STOMATOLOGY.

A REGULAR meeting of the society was held at its rooms, December 22, the President, Dr. James Truman, in the chair.

After the routine business, the reports of committees were called for.

Clinic Committee, Dr. Register, chairman, reports two clinics of the afternoon,—one, by Dr. F. D. Gardiner, upon the use of heavy rolled foils and the comparative merits of the electric, Register's, and Bonwill's mechanical mallets as welding instruments; the other, by Dr. H. E. Roberts, upon a novel and inexpensive electrical outfit.

Dr. Gardiner stated that the case upon which he operated and the lateness of the hour combined to make any actual demonstration of the subject incomplete and unsatisfactory. The preference of one form of mallet over another he believes to be more a question of individual familiarity with the instrument itself than of intrinsic superiority of any of the mallets. Each man chooses that which will best serve his taste. To one this will mean the electric mallet, to another, one of the engine mallets.

In manipulating heavy rolled foil it is to be remembered that we are dealing with gold plate, not hammered foil, and our work should be done with a recognition of the physical properties of the material. Like all gold plate, it should be annealed to redness, as any heat below this does not develop the full degree of cohesiveness. Instead of making the gold harsh and hard, as with foil, the heat actually softens it, makes it more plastic. The numbers of foil used in the clinic to-day were 60 and 120. To use these numbers requires absolute precision in manipulation, although perfect welding is accomplished by means of very light blows; each succeeding piece must be added to its predecessor without folding or wrinkling. Rolled foil is best adapted for use in spaces which have a narrow approach. When cut in narrow strips it may be carried to the depths of the cavity, and when the proper care is exercised be perfectly adapted. Another advantage possessed by it is its perfect welding under slanting blows.

Dr. H. E. Roberts.—The outfit I exhibited seemed to me to meet the requirements of the dentist better than any I had seen. The motor is small and comparatively noiseless, and is attached directly to the flexible arm or shaft. Other attachments for the cord engine can easily be made. It is most carefully and thoroughly made, and of exceptionally high efficiency, consuming only about one-thirtieth of one-horse power of electrical energy and giving ample power. One distinctive feature is that the armature runs on a hollow shaft, through which passes a shaft having a light iron disk, which is attracted to the armature, making a magnetic clutch when the current is turned on, but which is loose and runs free when the current is off. The other end of the shaft is attached to the flexible cable. When any stress is upon the bur and the current turned off to stop the motor, the armature will run free and the bur come to a stand-still, with no power to drive it. The motor, as shown, is wound to go with a new storage battery, which is novel and simple in construction, and forms a very important adjunct in the efficiency of the outfit. It is made of a series

of lead plates (fourteen in number), laid one upon the other, with a separating medium to hold a small amount of acid, and it makes practically a dry cell. Each plate represents two volts, one side being negative and the other positive, and as there are fourteen plates, we have twenty-eight volts in one box about twelve by twelve by twenty inches, giving twenty-five ampère hours. They are made in other sizes. The active material cannot fall from the plates. It is claimed that the battery can be short-circuited without injury, and in theory the longer it is used the more efficient it should become, until the whole substance of the plate is reduced to active material, taking a long time. The battery, being of twenty-eight volts, is admirably adapted for cataphoresis, and the manufacturers have gotten out the neatest (and apparently very efficient) volt-selector and regulator that I have seen. The plant was put in for me by Messrs. Louis Costa, Jr., & Co., 1227 Callowhill Street, the manufacturers, who also make other surgical and dental electrical appliances.

Upon the motion of Dr. Louis Jack, the date of clinics was changed to 2 P.M. on Saturday preceding the regular meetings.

The President.—We will now listen to the paper by Dr. S. H. Guilford.

(For Dr. Guilford's paper, see page 85.)

DISCUSSION.

The President.—You have listened to this clear and instructive paper of Dr. Guilford's; the subject is now open for discussion.

Dr. Burchard.—I do not think sufficient attention is directed by the dental fraternity to the grave question of the influence of dental pain upon mastication and nutrition in children. While the temporary teeth are developing, erupting, and in position, the alimentary canal and all of its glandular appendages are also undergoing developmental transformation, and influences, such as imperfect mastication, which would have an injurious effect upon the gastric and intestinal digestion in mature organisms, would certainly be fraught with greater danger when influencing organs which are in a developmental state. This in itself is serious enough matter, aside from local considerations, to warrant the close care of the temporary teeth.

The indications for the treatment of children's teeth are quite as clearly outlined as those for the permanent teeth; but there are unfortunate limitations due to the anatomical structure of the mouth and its organs, and the age of the child, which prevent us

doing what we should. We cannot do exactly what is indicated, but do only what we can.

There is one consideration which is of importance, and that is the anatomical organization of the tissues of the temporary teeth as compared with the permanent teeth. Tooth development, or the elaboration of the hard tissues of the temporary teeth, beginning at approximately the fifth or sixth month of intra-uterine life, is completed in the third, fourth, and sometimes fifth year. The development of the permanent teeth, from the formation of the enamel organs of the first permanent molar to the eruption of the second permanent molar, extends from the fourth month of intra-uterine life to the thirteenth or fourteenth year; the formation of one a matter of months where the other is a matter of years,—that is, there is a higher or more advanced organization of the tissues of the permanent teeth. Dr. Black's investigations have shown that the chemical analysis of teeth, as regards the amount of calcium salts contained in them, is not sufficient to explain the greater physical or, more particularly, the chemical differences which exist between teeth. While no one can question the accuracy of Dr. Black's analyses, every clinician recognizes the greater resistance offered by some teeth than others in cutting them. Studying Dr. Black's work, in connection with that of Dr. J. L. Williams, in the *Cosmos* of this year, I have become impressed that the differences in teeth are due to the anatomical organization of their several tissues,—that is to say, given a certain intimacy and degree of combination of calcium salts with albuminous material, to form the most resistant varieties of dentine and enamel, less resistant specimens would represent a lessened intimacy of chemical combination; they are insufficiently built or elaborated; the higher types have a higher anatomical organization.

I believe that Dr. Williams will at some time furnish us with a proof of this hypothesis.

I do not recognize the basis of objection to the use of zinc phosphate in temporary teeth. It can affect the teeth in one or more of three ways,—by the action of free acid sodium phosphate which it may contain. This is readily prevented by varnishing a cavity before inserting the cement; it might exercise pressure; the same objection obtains with any filling material. Its moderate conductivity might be a source of disturbance to the pulp, but I have never heard it complained of. Kept free from contact with lactic acid, the dental solvent, it disintegrates but slowly, therefore lasts well and does excellent service upon the masticating surfaces

of teeth. In approximal spaces it, of course, disintegrates, but still is sometimes useful there.

The uses of gutta-percha, amalgam, and, under favorable conditions, tin in the temporary teeth are indorsed almost universally.

We frequently hear the expression, "The large open canals of temporary teeth." Any one may demonstrate conclusively that there is an error here. Make some sections of the roots of temporary molars, and while you will find the pulp-chamber relatively large, as a rule, the canals are not large, and may be thin and tortuous. I mean, of course, in fully-formed roots, before resorption begins.

When we are confronted with abscess upon temporary teeth, not infrequently we have marked examples of the swift reactions of the infantile system. I have noted many cases of septic intoxication in connection with abscess upon the temporary teeth, and in some instances marked septic poisoning, rigors, a fever with temperature 104°, some delirium, and disturbances of the alimentary tract. These cases should have early evacuation and thorough syringing with pyrozone, three per cent., followed by an injection of a ten-per cent. solution of meditrina, and the symptoms usually vanish. After sterilization and the subsidence of the inflammatory symptoms, the roots of these teeth should be filled with balsamo del deserto if you can manipulate it; nearly all of my attempts to use it, following the directions given, have resulted in dismal failure, and recourse was had to salol or paraffine. Aristol is a good medicinal dressing for these cases.

In cavities which cannot be given a retentive form, the advance of caries may be prevented by rubbing the surface of the dentine with fused nitrate of silver. A portion of the salt is placed upon a platinum wire and held over a flame until fused into a button as described by Dr. Craven, this is to be rubbed freely over the dentine. Of course it discolors, but that is a minor evil in the temporary teeth.

Dr. Register.—I also believe in the importance of the relation between sound temporary teeth and the proper development of the digestive apparatus. Carried to its logical end we should find this a very serious matter.

To avoid the decay of the mesio-approximal surface of the first permanent molars, near the point of contact with the second temporary molars, it has been my practice to dress away the distal wall of the latter by means of a disk, leaving a shoulder at the neck to preserve a space between the crowns. I use iodine freely upon the

crowns of temporary teeth as a cleansing agent; to remove the green deposits I give the prescription,—

℞ Tr. iodi. co., ʒi;
Glycerini, ℥ii;
Ol. menth. pip., q. s. for flavoring. M.

This is to be painted upon the surfaces of the teeth by nurse or patient, and it does good service.

Dr. W. H. Trueman.—This essay would make very instructive and useful popular reading. Parents should be impressed with the importance of the facts given. You know we do not have dealings with ideal parents, although the latter always have in their own opinions ideal children, and this is a hard condition to contend with. I recall cases which are of interest in connection with the subject of the essay.

The first, that of a child whose teeth very shortly after eruption crumbled and wore away until the entire crowns were gone, and this was due more to faulty structure than to any diseased processes. The permanent teeth when erupted were good both in texture and form.

The second case I had where a marked mental impress resulted from a conspicuous facial deformity. A lad of about fifteen was brought to me. The day before, his elocution teacher had discovered a marked malocclusion that, strange to say, no one at home had noted, and this was his first visit to a dentist. He had been a delicate child, having been unable to walk, owing to imperfect development of the bony tissues, until about his seventh year. At this time his health was fairly good, and physically he seemed well developed. His mother informed me that he was of a very peculiar disposition, which they attributed to injury at birth, and to that also they attributed in a measure his delicate health during childhood. While he made fair progress in his studies at school he would not mingle with other children, took no interest in their sports, and at home showed a strong aversion to company; indeed, took but little interest in anything. On examination I found that in occlusion the second molars alone touched, and that the front teeth, when these molars were in close contact, did not meet by nearly three-quarters of an inch. He could not approximate the lips, and this gave him a marked idiotic expression. He seemed to be constantly making an effort to bring the lips together, thus making the deformity more conspicuous. I found him quite apathetic. He took but little interest in the examination, or the

suggestions made, and impressed me as being the idiot that he looked. The second molar teeth were extracted, and the first molars ground as short as prudence permitted. As an immediate result, the occlusion was so far improved that the bicuspid teeth became useful in mastication, the incisors approximated to within about a quarter of an inch, and the lips could be comfortably closed. The change in his expression was very great,—not more so, however, than the change in the boy: it was a transformation. It is a marvel to me that the cause of so marked a deformity should have so long escaped the notice of an anxious, watchful mother and that of the family physician, a near relative and a man of ability and experience, under whose care he frequently was.

How the deformity developed I could obtain no information; its existence was to them a surprise. I have no doubt that it was hereditary. I had a few years before made for his father a full denture, and had a great deal of trouble owing to the very marked disparity in the length of the posterior and anterior teeth. At the time the boy came into my care the father was suffering from paralysis, and, other than that he had been edentulous for many years, I was unable to obtain anything regarding his dental history. In this case the anterior teeth continued to approach, so that after the lapse of a year or two, without farther attention, they nearly met, and now the occlusion is fairly good. The mental peculiarities disappeared within a short time after he found that he could mingle with others without being stared at, and he became like other boys.

The third case is curious as exhibiting the effect of morbid sensitivity as to a physical blemish upon the mind. A child who was a thumb-sucker from infancy developed a condition of anterior protrusion of the upper teeth which amounted to a marked and very disfiguring deformity. When she attained an age when a physical blemish would be most noticed she developed a morbid sensitiveness as to her deformity, which so reacted upon her mind as to render her almost imbecile.

The work of Dr. Black, cited by Dr. Burchard, valuable as it is from a scientific point of view, has as yet but little clinical application, although it certainly will have in the future. All of us have noticed the difference of the resistive power of teeth to cutting instruments; some of them cut like soft wood, others almost or quite give sparks in cutting.

Dr. J. A. Woodward.—This subject is one of special interest to me. My practice in reference to the second temporary molar has

been to cut it away only when a strong shoulder can be left to retain the space and protect the gum between it and the first permanent molar.

When decay has so far progressed that this is not possible, I restore the contour of the temporary molar in amalgam. Should the permanent molar have a cavity in the mesial surface, that is filled with gutta-percha until the temporary molar is lost, when it can be easily contoured in gold previous to the eruption of the second bicuspid.

After treating abscesses and sterilizing, the roots of temporary teeth are filled with oxychloride. When their permanent successors appear the crowns of these teeth have very frequently been found to be rootless, resorption at times having uncovered the filling material in the root canals and floor of space occupied by the pulp.

Dr. Gaskell.—I have noted the perfect resorption of the root of a temporary tooth which had been violently displaced by a blow; the tooth was replaced, and lost at the age of eight years; the resorption of the root was complete.

Dr. Roberts reported a similar case.

Dr. Darby.—One of our great difficulties in dealing with the teeth of children is the devitalization of the pulps when indicated. I have used, and with much success, for this purpose a paste of powdered cantharides and carbolic acid; say about one-twentieth grain of the powder with enough carbolic acid or creosote to make a paste. I know that the use of arsenic for this purpose is justly viewed with much suspicion, but my opinion is that it is largely a question of how much arsenic is used. I use arsenic for this purpose in very minute quantities and have had no ill results. The canals of children's teeth should of course be cleansed thoroughly and sterilized. I question the use of cotton dressings in these cases, for should the foramen be large, owing to a partial resorption of roots, soft tissues might be impinged upon, and the cotton becomes a source of irritation or worse. I think the safer practice is to use fluid in the canals and oxychloride in the pulp-chamber. An old practice was to fill the crown cavity and drill a vent-hole through the root. This has been abandoned for good and sufficient reasons.

Dr. Burchard.—Touching this question of the resorption of the roots of temporary teeth, it is brought about by multinucleated cells, which are named from their function odontoclasts,—that is, the removal of the roots is a species of phagocytosis. The process begins usually upon some lateral aspect of the root near the apex,

not at the apex. Now, if the tissues of the pericementum be healthy, the process goes on uninterruptedly; if they are the seat of disease, this cellular function is not performed. The most prominent source of disturbance is debility of these cells from poisoning by the action of the waste-products of pathogenic organisms, notably the pyogenic organisms. If this poisoning is prevented by absolute sterilization, the resorption occurs even in the absence of the pulp, as has been shown here this evening. The resorption begins very soon after the roots of the teeth are complete; the building up is very quickly followed by the tearing down. The roots of the temporary teeth are completed between the fourth and sixth years. The sum and substance of the problem is to prevent the entrance of pyogenic organisms to the apical portions of the pericementum, and this means constant care.

Dr. A. H. Porter.—We talk here of chemistry as though it were the basis. We should look also to the physical condition of the teeth. Chemistry is but a subdivision of physics. I think we should look to the electrical conditions between our fillings and the teeth. We have heterogeneous substances present, and why not electric currents? Lord Kelvin says he has studied electricity for fifty years, and even now knows nothing about it. We are ignorant of the deeper meanings of this question of electricity.

I believe in mixing carbolic acid with zinc phosphate when using it in children's teeth.

Dr. Register.—The question is in the treatment of the temporary teeth to prevent local septicæmia. If we do that resorption can go on. I do not believe in using oxychloride or cotton dressings, for when exposed by resorption they are irritating. It is my practice to use salol.

Dr. Guilford.—Before reading my paper I felt like apologizing for its elementary character. I had no new views to present upon the subject, and chose it only because it is one seldom considered at dental meetings, but yet one of great importance to all practitioners.

I feared that what I might have to say would provoke no discussion, but have been pleased to find so many ready to express their views.

The council asked me to write a *short* paper, and so I felt that I had to be brief, and therefore could not touch upon some points or elaborate others. Nitrate of silver has certainly proven itself of great value in checking caries in the deciduous teeth, and should be employed more frequently than it is.

I should, perhaps, have mentioned that I use arsenious acid for

the devitalization of deciduous pulps, just as I do for those of the permanent teeth, but I apply it in the minutest quantity and do not allow it to remain longer than from six to twelve hours. I have never seen any ill results from its use when used sparingly and carefully.

I was pleased with Dr. Burchard's explanation of why the roots of devitalized teeth were not resorbed in some cases and were in others. The idea was new to me, but I believe his reasoning to be correct.

Adjourned.

Henry H. Burchard,
Editor Academy of Stomatolgy.

CENTRAL DENTAL ASSOCIATION OF NORTHERN NEW JERSEY.

A regular meeting of the Association was held on Monday evening, October 19, 1896, at the parlors of Mr. Simon Davis, 943 Broad Street, Newark, N. J., the President, Dr. Walter Woolsey, in the chair.

Dr. F. C. Barlow, chairman of the Executive Committee, reported as follows: Your committee announce with pleasure that they have secured for this season the names of more men eminent in our profession than we have been able to procure heretofore, and consequently will have papers of high merit each month. This evening we have the pleasure of introducing to you Dr. Broomell, of Philadelphia, whose lantern slides have been exhibited before many of the colleges, and have elicited encomiums of their merit and accuracy in phases of dental anatomy and histology. The succeeding month we announce as the essayist Dr. Joseph Head, of Philadelphia, who will read a paper on dental ethics. The name of Dr. Head is a sufficient guarantee of the excellent quality of the paper promised. Further announcements will be made later on.

The President.—The next thing in order is the paper of the evening. I have the very great pleasure of introducing Dr. I. Norman Broomell, of Philadelphia, who will give us an illustrated lecture on the subjects of dental anatomy, dental pathology, comparative (dental) anatomy, palæontology, and dental histology.

Dr. Broomell.—Mr. President and gentlemen, what I have to

offer to you to-night will be more in the line of entertainment than of scientific information. The subject will consist of a limited number of slides from each of the following classifications: Dental anatomy and pathology, comparative dental anatomy, palæontology, and dental histology. I might say that a number of these slides I made about two years ago, principally for the purpose of supporting an argument which I had advanced in a paper favoring the half-tone or process work for the illustration of dental subjects in preference to the old but probably more skilful methods of hand engraving. Since that time I have had the satisfaction of seeing a number of the illustrations in what is probably the leading dental journal produced by this method, and it is some satisfaction to me to be informed that my efforts in this direction have had much to do with the change. Until quite recently dental subjects for illustration were not considered to be of such a nature that they could be accurately reproduced by photographic methods.

Some of these slides, as I have said, were made for the purpose of ascertaining what could be done in this direction, while others I have selected from different papers upon the subjects which they respectively represent. I hope the absence of a positive text may not prove a disappointment to you.

[Dr. Broomell then followed with an exhibition of twenty-five slides on anatomy, followed by forty-one on comparative anatomy, also twelve upon histological subjects,—making a total of seventy-eight slides. As these could not be well understood without accompanying illustrations, the following portion from the comparative anatomy of the teeth is given, as representing this interesting collection.—Ed.]

1. Tooth of a mastodon. The elephant is the only living representative of the species known as the mastodon, which lived in a preceding geological epoch. The molar here shown differs from that of an elephant in one or two particulars. The saw-shaped surface does not exist in the elephant's molars, and the lines of enamel are somewhat circular in formation, while in this tooth they are almost parallel. The molars of the elephant are continually in process of destruction and formation, succeeding each other horizontally. They are successively brought forward until each jaw has had on each side six, or twenty-four in all.

2. Palæontology, the science which treats of the evidences of organic life upon the earth during past geological periods. These evidences consist in the remains of plants and animals embedded or

otherwise preserved in rocky strata, or upon their surface. The term "fossil," which has been given to these specimens as found, is described as "the remains of an organized body which has been embedded in the earth at an unknown epoch, which has been then preserved, or which has left positive traces of its existence." This excludes, of course, the modern remains of plants or animals which have been buried or lost by landslides, floods, etc., of our times. These evidences may exist in two ways, either the petrified remains themselves, or the imprints, designating the position which they once occupied.

Fragment of upper jaw and teeth from the White River, Dakota. The teeth themselves in this specimen, as in the next few to follow, appear to show no change in structure, while the portion representing the bone has changed into a rock-like mass.

3. Upper first and second true molars from the Niobrara River, Neb.

4. Upper jaw and teeth of extinct mammalia, also found in the Niobrara River, Neb. The buccal aspect of these molars appears to be abraded from the overlapping of the corresponding inferior teeth.

5. Lamna, specimens of the simplest form of shark teeth.

6. Three very good specimens from the White River, Dakota, being of the mastodon family, and depicting a most perfect, petrified mass, even to the striated condition peculiar to rock-formation.

7. A tooth from the extensive marine family, the shark, coextensive with the rays and skates. In the earlier geological times the shark attained tremendous proportions, frequently being from thirty to forty feet in length. The tooth specimen here shown represents one of the large variety, but of the simple form, the inner cutting edge being only slightly serrated, while the outer edge is a knife-cutting one. In some of the tertiary-formations at Malta, teeth of this class have been found measuring seven inches in length and four and one-half inches in breadth at the base.

8. Another variety of shark tooth, and a typical tooth of a large proportion of the shark family, conical in shape, with sharp and deeply-serrated edges, and a separate cusp upon either side at the gum margin. These teeth are placed in the jaws in several rows, and the anterior ones have erectile power. Some genera have the peculiarities of a mesial tooth, and when this centre tooth does not exist there is left an unoccupied space of about the size of the adjoining teeth. The deeply concave surface rests upon the jaw, while the erectile muscles are attached upon either side.

9. Teeth of extinct miocene mammalia, found in the marl banks of Cumberland County, N. J. The formation of the enamel of these teeth is peculiar, being one mass of sharply-defined, conical-shaped cusps, not shown very distinctly, however, in the picture.

10. Dental pavement. The petrified remains of the pavement-like teeth of one of the extinct shark family. Fishes provided with teeth of this form use them by a rubbing or triturating motion.

11. Here is shown another set of teeth of the same order, belonging to the ray family, each being provided with two sets, and when actively engaged in performing their duty they rotate or rock back and forth upon each other, crushing the sharp, penetrating bones of their prey, without fear of injury to themselves.

12. Two more specimens, showing not only a peculiar formation, but a neat and almost beautiful arrangement of the pavement-like dentures, belonging to the fossil fish of the skate family. At one point you may see one of these teeth which has been removed from its shallow socket, while in the other specimen may be seen the very beautiful arrangement of the enamel.

13. Another specimen of the pavement-like type, the teeth occupying the whole surface of the maxillary bone.

14. Crustacean, Phillippi, Japan. Port Jackson shark.

15. Elephant tusks. The tusks of the elephant are nothing less than monstrous incisor teeth. The temporary tusks make their appearance about the sixth month, and are not more than two inches in length and one-third of an inch in diameter. These are shed about the second year, and the permanent tusks begin to grow, continuing to do so from their base during the life of the animal.

On motion of Dr. Meeker a vote of thanks was extended to Dr. Broomell for his excellent entertainment.

Adjourned.

H. S. Sutphen, D.D.S.,
Secretary.

Editorial.

THE EVOLUTION AND ABUSE OF THE SERRATION.

The formation and development of a profession or calling is always an interesting subject for the historian, and for those specially trained in this direction there is no study more productive of good results. The busy worker performing his daily task, although a part of the machinery of evolution, has no time, or is apt to think he lacks leisure sufficient, to go beyond the present. That this is a mistake and leads to serious and amusing blunders needs no assertion, the proof being furnished in almost every dental periodical. That a few have made an attempt to rescue the almost forgotten work of the past and forced it to yield up its treasures, even in a limited degree, is a very satisfactory indication that the thought is growing that progress cannot be intelligently made unless the steps leading to the point attained be carefully and reverently trodden.

Minor details, apparently insignificant, but of vital importance when viewed in their connections, are being daily consigned to oblivion, and the patient investigator of historic problems is forced to say that the origin of this or that is lost in the obscurity of the past.

It, therefore, becomes the duty of the faithful chronicler to occasionally pause and permit the varied problems of the present to pass by, or be solved by others, while he brings to the surface some of the apparently insignificant things in the profession of dentistry.

With something of this spirit the writer would call attention to the evolution of the serration and its use, progress, and, it might be added, the abuse in the work of compacting metals in teeth.

The history of the serration is quite modern, as it is understood and connected with dentistry. The writer has been unable to find much in the literature of this profession in relation to it prior to the middle of the present century. In the edition of 1850 of Harris's "Principles and Practice," no allusion is made to serrations, but his instruments for condensing gold show a simple crucial file-mark on the edges. This corresponds with the memory of the writer, for at that time the serration, as now understood, was un-

known, and dentists very frequently made the cross cut with the file on their smooth-pointed instruments. It is also within the memory of the writer that rounded and flat points were used almost exclusively to pack the soft gold in the early forties.

From 1850 to the introduction of cohesive gold, it is very certain that the dental profession, as a whole, found very little use for the serration in the condensing of non-cohesive gold, and operators were content with a roughness made, as heretofore stated, by hand-filing, with no attempt to make these a part of the process of condensation.

Those who were in practice when Dr. Arthur introduced cohesive gold in 1855 will, doubtless, recall the frequent abortive efforts to use this gold with the instruments then provided. Filling by the use of this character of foil, which is the character all gold possesses when not tampered with after refining, if not impossible, was at least rendered very difficult, and many never succeeded in filling teeth with it.

The explanation for this was to be found in the fact that the points of pluggers were poorly fitted for the work. It then became a necessity to have serrations, and from this date, 1855, it must be conceded, the serration took its rise. The first made were but little more than exaggerations of the crucial file cut; but eventually they assumed various forms, some almost straight, needle-shaped, and others, triangular or pyramidal, extending from a common base, and all, of whatever form, exceedingly sharp. This latter quality was considered essential, so much so, that the manufacturers furnished knife-edged stones to enable the dentist to keep these serrations always up to the original standard.

Then came the introduction of the mallet in its protean forms, hand, automatic, and power, and then it was discovered that the older, sharp serration was not only unnecessary, but was regarded as an absolute injury by pitting the gold. This led to a gradual reduction of the serrations until we have instruments to-day on sale, at the various supply-houses, that are, in the opinion of the writer, practically unfit to use in filling teeth. The circle has been thoroughly traversed, and from the original file cut we have come round again to very nearly the same form, having tried all the intermediate stages of serrations.

The question that interests us to-day is, Has this movement in the circle been of advantage to the profession of dentistry in its practical work? In order to answer this query intelligently the object of the serration must first be considered; originally it was

nothing more than a means to prevent the instrument slipping over the gold, and in no sense could it be regarded as a factor in condensation. With the use of cohesive foil it was found that the cohesive property could not be relied upon universally. Theoretically it was true that two clean surfaces of gold must cause cohesion through the attraction of the atoms, alike common to solids and fluids, so that two sheets of gold could not be separated when fairly placed one upon the other. If this property could always have been maintained, then filling of a tooth simply meant adding layer upon layer, but it was soon discovered that this did not always occur, and the dentist of the period was obliged not only to remove this tendency to non-cohesiveness by heat, but also was forced to use some means to insure the union of each lamina of foil, hence the sharp serration which accomplished it in part mechanically, by pinning one piece to another. This was found not quite so essential under the direct impact of the mallet, and, as heretefore stated, serrations of the sharp variety were generally abandoned.

If gold foil could be maintained at the same standard as it leaves the hands of the manufacturers, and that indefinitely, there would be no need of serrations. This, however, is not the case with gold foil, for the reason, demonstrated by Dr. Black, that gold is peculiarly liable to be affected by gaseous deposits, which largely destroy its cohesive property. The impossibility of securing fresh gold foil by the great majority of dentists must ever make this form of cohesive gold a source of difficulty to many operators, and especially so to beginners. Annealing may help, but it does not entirely remove the objection, neither does the remedial process proposed by Black, and the fact remains that, to the man who works a comparatively small amount of gold foil, its use, with the present form of serrated instrument, has become a matter of serious concern, and this will continue just as long as manufacturers depend for their information, of what is needed, upon the opinion of those nearest the centre of professional excellence.

It is quite evident to some of those who are called to observe the struggles of beginners that the serrations of to-day are practically wrong, and while this may not be so serious with power mallets and gold, it becomes an absolute bar to good work with hand pressure and with tin. This metal must be used, if used at all, with a proper understanding of its cohesive property. The serrations here must be of a positive character and sharply defined.

The theory of some that gold can be burnished into a cavity by a smooth point or a point simply roughened is true only in a modi-

fied sense. That a satisfactory filling can be placed in by this method there can be no question, but is it of universal application? The answer, it would seem to the writer, must be in the negative. With the daily deterioration of gold foil after it leaves the manufacturer, the necessity for deeper serrations is evident, and the further removed the individual is from the great centres of supply the more will these be required.

The argument used against deep serrations is, as before stated, that these pit the gold. This is not a serious objection and need not hold with the last layers, which can be condensed by broader instruments and shallower serrations.

It has been very evident to many that the standard of work in filling has greatly degenerated in the past few years. Formerly the class of superior operators was the rule and the inferior the exception, but conditions are exactly the reverse. If this be true, and there are good reasons for the opinion, the cause of the falling off should be investigated. It is particularly noticeable in the rising generation of dentists, and it is the decided opinion of the writer that this may be largely ascribed to erroneous ideas, prevailing generally in regard to instruments as well, in some degree, to methods.

The intention of this article will have been subserved if it succeeds in calling attention to the necessity of reviewing this whole subject. It is a delicate matter and stands on debatable ground, for those wedded to different methods will set their faces sternly against the views here promulgated, and, perhaps, with good reason, for they may never have had occasion to work with gold foil, months from the gold-beater's hands. When they have had this experience, they will learn that while all is "not gold that glitters," neither is all gold cohesive that goes under that name. In order to use it without fear and without embarrassment, there must be a return, not to the needle-shapes of the earlier serrations, but to the common sense form that will aid in interlocking the crystals without an entire dependence on the unstable property of cohesion.

Bibliography.

The Items of Interest for January, 1897, is certainly a new departure in dental journalism, and the editor, Dr. R. Ottolengui, deserves to receive congratulations not only for the life he has succeeded in infusing into this trade journal, but for the somewhat original conceptions connected with it. If success comes in the truest and best sense it will not be through the influence of flaring heads and subheads, but by a higher and broader conception of what is truly needed in dentistry.

The "Items of Interest" has heretofore catered to an element in dentistry that regarded condensed statements as all sufficient. If the present editor can induce an enlarged view of scientific study he will have accomplished a great work. The Items in its improved form cannot yet be regarded as the "best dental journal" nor even the best trade journal, but it comes nearer that than the former.

The dental public is not particularly interested to know whether these improvements in the "Items of Interest" cost five thousand dollars per year more than heretofore, but it should be interested to have an addition to dignified journalism, but whether this will meet that want remains for future numbers to demonstrate.

Dental Materia Medica, Pharmacology, and Therapeutics. By Charles W. Glassington, M.R.C.S., L.D.S., Edinburgh, Senior Dental Surgeon, Westminster Hospital, etc. London: J. & A. Churchill, 1896.

This book, while in one sense a compend, has the merit not possessed by all such works of being concise, and at the same time supplying, if not all the information required, sufficient for the average student to memorize.

For a small book it is admirably arranged, omitting much that is superfluous in the study of Materia Medica, while at the same time it gives ample scope to matters that require special attention in dentistry. The therapeutic division is generally quite full, and there is much throughout the book that deserves special praise, and but little to condemn.

The following advice in the writing of prescriptions is worthy of being followed by those who delight in complicated formulæ: "Some drugs, when properly combined, materially assist the action of others; but if one is *certain* of the action of a single drug, by all means use it without combination."

It is not to be expected that a book of this size would or could give the authority for each statement, but omission in this respect leads to error. In the use of chlorinated lime for bleaching teeth the entire process is given without credit to the one originating it.

A very excellent chapter on "General Anæsthesia for Dental Operations," by James Maughan, M.B., London, anæsthetist, National Dental Hospital, closes this volume, which can be recommended as superior to most of its kind and valuable to the student as a book of reference.

Obituary.

RESOLUTIONS OF RESPECT, DR. GEORGE C. BROWN.

THE following resolutions were passed at a special meeting of the New Jersey State Dental Society, Friday evening, February 5, 1897, at Newark.

WHEREAS, It has pleased Almighty God to remove suddenly from the midst of his active labors our fellow-member and Treasurer, Dr. George C. Brown:

Resolved, That this society hereby desires to place upon record their high appreciation of his manly Christian character and of his high professional standing, as well as his genial and pleasant presence.

Resolved, That we mourn his death as a personal as well as professional loss, and hereby desire to testify of our high appreciation of his efforts he always and at all times gave to the profession of his adoption, and his devoted activity to the advancement of its welfare.

Resolved, That we mourn with his afflicted family, and extend to them in this hour of trial our sympathies.

Resolved, That a copy of this resolution be sent to his family and be placed upon the minutes of our society, and be published in the journals devoted to dentistry.

Signed, C. S. STOCKTON,
F. C. BARLOW,
J. ALLEN OSMUN,
Chairman.

DR. FRANCIS PEABODY.

Dr. Francis Peabody died at Fort Myers, Florida, January 30, 1897. He had been in failing health for a year, and it was hoped a visit to a more genial climate would be of benefit, but this did not have the effect desired, and he passed away as above stated.

Dr. Peabody was born in Boston, Mass., January 22, 1833. He came to Louisville when he was yet a young man and began the study of dentistry with his uncle, Dr. W. H. Goddard, who was one of Louisville's distinguished dentists in the early days. After studying with his uncle for some time he went to Cincinnati, and graduated in the profession from the Ohio Dental College.

He married before the war and went to Tennessee with his wife and two children.

While he took no active part on either side during this conflict, he sympathized with the South, and at one time was imprisoned as a Confederate spy under a mistake.

He remained in practice in Louisville until 1871 when he went to Brazil, practising his profession in Rio Janeiro. He returned to Louisville subsequently and remained there in practice until his death.

Dr. Peabody was not only well known in Kentucky, but in other parts of the country.

He was elected to the faculty of the Louisville College of Dentistry in 1888, and has been head of that institution for the past six years. He has also been president of the Kentucky State Dental Association. He was an active member of the National Association of Faculties, American Dental Association, Southern Dental Association, and Mississippi Valley Dental Association. He was elected president of the Falls City Dental Club last year.

The intimate association which the writer has had for some years in the work of the two dental organizations, the American Dental Association and the National Association of Dental Faculties, has led to a high appreciation of his marked ability in many lines of professional work. His energy combined with the quality of thoroughness in everything undertaken made him a most valuable member in both bodies, but especially so in the latter. The members of this body will learn with deep and lasting regret that they can never again have the privilege of his genial companionship or the benefit of his ripe and cultivated judgment.

The resolutions of the Louisville College of Dentistry and Hospital College of Medicine are appended.

WHEREAS, Professor Peabody was the champion of many advances in dental education within the period of his professional career. He always insisted upon the intimate relation of dentistry to the profession of medicine, and maintained that the ethics of the medical profession necessarily included the profession of dentistry. He was an enthusiastic student, an able teacher, and a practitioner of rare skill and ability.

Resolved, That we deeply deplore his death and feel keenly the loss of his wise counsel and the great loss of his services to this college.

Resolved, That in our judgment the dental profession has suffered the loss of one of its ablest members.

Resolved, That the college buildings be draped in mourning for thirty days, and that the buildings be closed on the day of the funeral.

Resolved, That a committee communicate with the family of the deceased and make suitable preparations for receiving the remains on arrival at the depot and aid in the arrangements for the funeral.

Resolved, That the joint faculties and students attend the funeral in a body.

Resolved, That we tender to the family of our deceased colleague our profound sympathy and condolence.

Resolved, That a copy of this action be furnished the family of the deceased, and that it be made a part of our permanent records.

Resolved, That a copy be furnished the press for publication.

EDWARD M. KETTIG,
JOHN A. LARRABEE,
HENRY B. TILESTON,
THOMAS HUNT STUCKY,
DUDLEY S. REYNOLDS,
Committee.

In Memoriam.

DR. JAMES A. SWASEY.

WE are called upon to mourn the death of one whose face will no longer be seen in our midst, Dr. James Atwood Swasey, for many years an active member of this society.

This sad event occurred early in the morning of December 24, 1896, at his residence, 1317 Michigan Avenue, Chicago.

Dr. Swasey had been in his usual good health up to about the middle of November, when he first noticed that he was suddenly breaking, and for a few days he went to the West Barden Springs; but not finding the desired relief, he returned to his summer home in Michigan, and from thence came to Chicago, where he died surrounded by his family and friends.

Dr. Swasey was the President of this society when the twenty-fifth anniversary was celebrated in 1889. He was President of the Odontological Society of Chicago in 1894–95, a member of the Illinois State Dental Society, the American Dental Association, and a member of the first International Dental Congress, Paris, France, 1889. He was also the first President of the Chicago College of Dental Surgery, and was re-elected for several years. He was an honorary member of several dental societies, State and local, in the United States.

The society loses one of its best representatives in the death of Dr. Swasey.

He was a man of strong character, high-minded and generous, with a pleasing manner, modest in his estimate of his own acquirements, ever ready to counsel and assist others.

He was a firm friend, a strong partisan, energetic and industrious, an inventor of many useful appliances, and devoted to his profession to the last.

We will miss his familiar face and hearty grasp of the hand in all of our subsequent sessions.

We mourn with his family in this hour of affliction, and extend our sympathies.

We place these lines of respect to his memory in our journal records, with the thought that his life had been a useful one to the community where he had resided for so many years, and with the ever-present hope and belief in the immortality of his spirit forever and forever.

Be it resolved, That a copy of this tribute be sent to his family, and others to the dental journals for publication.

A. W. Harlan,
Truman W. Brophy,
F. H. Gardiner,
Committee.

Domestic Correspondence.

CORRECTION.

To the Editor:

Sir,—The J in the next to the last line, page 49, of the January number should have been T. Mons. Ore Taveau has been credited with introducing amalgam into dental practice in 1826. In the first edition of his work, "Hygiène de la Bouche," published at Paris, 1826, he refers to fusible metal for filling cavities of decay; I find, however, no mention of silver paste. In the fifth edition of the same, Paris, 1843, page 236, following his reference to fusible metal and a modification of it made by adding mercury, he speaks of a paste that he has used seven or eight years with considerable advantage, which he has named "pâte d'argent (silver paste), and states that it is made by mixing silver in a very fine powder with a sufficient quantity of mercury and thoroughly incorporating them. When and in which one of Mons. Taveau's intervening works the above first appears I will be pleased to know.

William H. Trueman.

Notes and Comments.[1]

Are We all at Sea?—In following closely the investigations of Dr. G. V. Black upon the "Physical Characteristics of the Teeth," contributed to the *Dental Cosmos*, one would naturally ask the question, "Are We all at Sea?" Are we to believe, accept, and act upon Dr. Black's most important conclusions? Some of these are that caries of the teeth is not dependent upon the condition of the tissues of these organs, but upon the condition of their environment; that there is no basis for the supposition that some teeth

[1] The assistant editor solicits contributions for this department,—new methods, new remedies and formulas, or any short practical note which may prove of value to the practitioner or student. Address 1718 Walnut Street, Philadelphia.

are too soft or too poorly calcified to bear filling with gold; no basis for the supposition that the teeth of children under the age of twelve are too soft to receive such fillings; no basis for the selection and adaptation of filling materials to soft, hard, or poorly calcified teeth; the only basis for the selection of filling materials is the operator's judgment as to which *he* can most perfectly manipulate. Also that there is no basis for the supposition that pericemental inflammation, or pyorrhœa, attacks dense teeth any more than those less dense. Come forward, histologists, microscopists, and pathologists, and tell us,—Are we all practising and teaching such radical errors? Are we all at sea?

"Platir."—Dr. W. Storer How, in writing upon alloys in the *Dental Cosmos*, says, "An alloy of platinum and iridium has long been in use by dentists in plate, wire, and other forms, and a brief designation of the alloy has hence become a desideratum." Iridio-platinum, or platinum and iridium, he says, have hitherto been the cumbersome terms used for indicating the compound metal, and in the interest of economy, brevity, and perspicacity the term *platir* is suggested. Platir plate, platir wire, platir posts, etc., would therefore be used whenever those articles were desired to be composed of an alloy of platinum and iridium. Dr. How does not state what the term platir indicates, from what it is derived, or give any reason for adopting it.

There are certain words and phrases which convey certain definite ideas to our minds,—iridio-platinum and platinized gold are examples,—and when we are counselled to discard them we must have good and sufficient reasons for so doing.

Methods of Tooth-Bleaching.—A correspondent asks us to give "Dr. Kirk's method of bleaching teeth" through "Notes and Comments." Dr. Kirk has done much in the study of tooth-bleaching methods, giving us from time to time valuable information upon the subject, and has published two original methods for accomplishing this object,—viz., one in which sulphurous acid is evolved from a mixture of boracic acid and sodium sulphite, which is detailed in the "American System of Dentistry," and another one suggesting the use of sodium dioxide, reported in the *Dental Cosmos* of March, 1893. His more recent practice, however, is about as given in the following quotation.

We assume that our correspondent understands that the best results are accomplished when the products of decomposition in the dentinal tubuli are removed. This may be accomplished, as Dr. Kirk says in a paper before the Pennsylvania State Society, "either by combining with hydrogen dioxide a caustic alkali which will saponify and render soluble all fatty matter and organic *débris*, or by the use of sodium dioxide, a compound which combines in itself the properties of both hydrogen dioxide and a caustic alkali. For the former process I know of no better method than that devised by Dr. D. N. McQuillen, in which he precedes the application of pyrozone twenty-five-per-cent. by the use of Schreier's kalium-natrium preparation. This renders thoroughly soluble the contents of the pulp-chamber, canal, and tubuli, which are afterwards bleached and mechanically cleansed by the chemical and effervescent action of the pyrozone. After a tooth has been thus bleached its structure should be saturated with some indestructible material to prevent subsequent ingress of matters which may cause rediscoloration. For this purpose I use a lacquer which consists of a solution of pyroxylin in methyl alcohol, known as "kristaline."

"A Blot on the Profession."—Dr. W. H. Trueman, in writing upon the subject, says there is in the leading paper of the December (1895) number of the *Dental Digest* a point which, to his mind, especially invites criticism. It is this,—and it is a fault far too common in our profession,—the gross, if not inexcusable, carelessness in the use of assumed facts upon which to base disparaging remarks regarding a professional brother. The writer makes a grave accusation upon either the intelligence or the integrity of men of good repute and of recognized skill, based upon the bare statements of patients who were formerly under their care. What evidence had he that those statements were true? What evidence that they were not, unintentionally perhaps, misleading? So far as the article shows, he made no efforts and exercised no care to verify the statements made, but at once pronounced judgment that the three operators—whose acknowledged professional attainments, if a well earned professional reputation is worth anything, fully entitled them to a hearing—were guilty of either ignorance or indifference regarding a most important question.

Current News.

DENTAL SOCIETY OF THE STATE OF NEW YORK.

The Twenty-ninth Annual Meeting of this society will be held in Albany, May 12 and 13, at which time the following programme will be presented:

President's Annual Address, H. J. Burkhart, D.D.S.

Report of the Correspondent, R. Ottolengui, M.D.S.

Report of the Committee on Practic, A. R. Starr, D.D.S.

"Amalgam Fillings, with a Practical Demonstration," G. V. Black, M.D., D.D.S., Sc.D., Jacksonville, Illinois.

"Dental Organizations," James Truman, D.D.S., Philadelphia.

"Irregularities of the Teeth and their Correction," J. N. Farrar, M.D., D.D.S., New York.

"Cataphoresis," H. W. Gillett, D.M.D., Newport, R. I.

Subject to be announced, B. Holly Smith, M.D., D.D.S., Baltimore.

Members of the profession are fraternally invited to attend.

H. J. Burkhart, D.D.S.,
President, Batavia.

C. S. Butler, D.D.S.,
Secretary, Buffalo.

TWELFTH INTERNATIONAL MEDICAL CONGRESS.

Moscow, August 19–26, 1897.

Section of Dentistry.

We have received the following general circular from the members of the committee of this section of the Medical Congress, and give it the publicity that its importance deserves.—[Ed.]

Dear Sir and Colleagues:

The Organizing Committee of the Section of Dentistry of the Twelfth International Medical Congress in Moscow have the honor to send to you herewith the regulation of the congress,

together with the programme of the mentioned section, and to respectfully solicit your assistance in insuring the section's success by your presence here, and by a report upon one of the questions in the said programme.

In accordance with the 17th paragraph of the regulation, papers dealing with the subjects named in the programme will have preference over others. This does not, of course, exclude communications upon other subjects, but such communications can only be read provided that time permits. We would therefore venture to suggest that, if possible, the subject of your paper should be chosen from the enclosed list. We feel sure, however, that even should you elect to make a communication upon some question not mentioned in the programme, an opportunity will undoubtedly be found to enable you to read it.

Should you wish to make a report, it is very important to receive the same, or, at any rate, a short account of it, before May 1, 1897, for printing and distribution among the members of the congress.

Trusting to hear favorably from you, we remain, Dear Sir and Colleague,

Yours faithfully,

Dr. F. Rein,
The Manager of the Section.
Dr. I. Kowarsky,
Dr. N. Nesmejanow,
Dr. S. Urenius,
The Members of the Committee.

The address of the Manager: Dr. F. Rein, Moscow, Little Dmitrowka, h. Scheschkow.

THE PROGRAMME OF THE OCCUPATIONS OF THE SECTION OF DENTISTRY OF THE TWELFTH INTERNATIONAL MEDICAL CONGRESS IN MOSCOW.

1. What kind of general and special learning is desirable for the persons who are to occupy themselves with dentistry? The lecturer: *Professor Dr. Julius Scheff* (Vienna).
2. The hygiene of the cavity of the mouth and of the teeth.
3. General and local anæsthetics for tooth-extraction. The lecturer: *Dr. V. Richardson* (London).
4. Cataphoresis in dentistry.
5. The essence and treatment of pyorrhœa alveolaris. The lecturer: *Professor Dr. József Arkövy* (Budapesth).

6. The treatment and filling of the pulpless teeth.

7. Crown- and bridge-work from the hygienic and technical point. The lecturer: *M. Morgenstern* (Baden-Baden).

ODONTOGRAPHIC SOCIETY OF CHICAGO.

At the annual meeting of the Odontographic Society of Chicago, held December 14, 1896, the election of officers resulted as follows: President, Geo. B. Perry; Vice-President, G. W. Schwartz; Treasurer, Edmund Noyes; Secretary, H. H. Wilson.

Member of Board of Directors, W. H. Fox; Board of Censors, E. K. Bennington (chairman), A. G. Johnson, and H. J. Goslee.

H. H. Wilson,
Secretary.

THE ST. LOUIS DENTAL SOCIETY—OFFICERS FOR 1897.

President, John H. Kennerly; Vice-President, P. H. Eislœffel; Corresponding Secretary, John G. Harper; Recording Secretary, C. C. Cowderly; Treasurer, A. J. Prosser.

Committee on Ethics.—J. E. Pfaff, J. P. Harper, William Conrad.

Committee on Publication.—F. F. Fletcher, W. M. Bartlett, De C. Lindsley.

THE CENTRAL DENTAL ASSOCIATION OF NORTHERN NEW JERSEY.

At the Annual Meeting, held on the 15th of February, the following officers were elected for 1897–98: President, Wm. L. Fish, D.D.S., Newark; Vice-President, F. Edsall Riley, D.D.S., Newark; Treasurer, Charles A. Meeker, D.D.S., Newark; Secretary, Herbert S. Sutphen, D.D.S., Newark.

Executive Committee.—Geo. E. Adams, D.D.S., South Orange; W. E. Truex, D.D.S., Freehold; C. S. Hardy, D.D.S., Summit; F. S. Gregory, D.D.S., Newark; Fred. C. Barlow, D.D.S., chairman, Jersey City.

H. S. Sutphen, D.D.S.,
Secretary.

Selections.

OXIDATION.

A RECENT article by an eminent English physician calls attention in an especial manner to the prime necessity of oxidation in the economy of healthy humanity and causes us to realize, even more forcibly than we hitherto have done, how absolutely necessary oxidation is for health.

In the blood of an average human being there are continually circulating 2,250,000 of little red corpuscles, little bodies, little boats, so to speak, whose chief function is to receive a store of oxygen in the lungs, and carry it throughout the body.

When we realize that one can live for weeks without food, for days without water, but not for five minutes without air (the vitalizing ingredient of which is oxygen), are we not compelled to recognize the absolute necessity of oxygen?

When we remember that life is a constant molecular change, and when we realize that oxidation is the process of molecular change, are we not forced to rightly estimate the importance of oxygen to health?

Fresh air—ventilation—plenty of oxygen; they all mean the same thing, and they mean one of the greatest requisites of health.

FORMALIN GELATIN: A NEW MODE OF ANTISEPTIC TREATMENT.

IN the *Therapeutische Monatschrift*, January, 1896, Dr. Schleich relates his experiences in the use of formalin gelatin in the treatment of wounds. The formalin gelatin is prepared by drying gelatin dissolved in water over formalin vapor. A firm, resistant, stony-hard, transparent body is thus formed. The question first to be decided was whether the gelatin would gradually dissolve and give off its formalin, and in this way set up a continued state of asepsis in its neighborhood. In the first experiment resection of intestine was performed on a rabbit, and before closing the abdominal wound

a piece of formalin gelatin, the size of an apple, was introduced into the abdominal cavity. The animal was killed six and a half weeks later, and only a minute remnant of the gelatin was found in the midst of the newly-formed connective tissue. Further experiments were modified by the author to the extent that a quantity of virulent bacteria cultures was mixed with finely-powdered formalin gelatin and introduced into the system, all of which were absorbed without any reaction. These results led the author to use the gelatin in the treatment of wounds in the human subject. It was used in the form of powder, and Dr. Schleich became satisfied that it was gradually decomposed with continuous freeing of formalin, and consequent steady asepticism of the wound. Up to the time of writing he has used it in one hundred and twenty cases of acute suppuration, ninety-three aseptic healings of wounds, four compound fractures, and two deep scalp wounds, and he was in a position to state that by its means, all acute suppurations were cut short, and that in every wound an aseptic course could be guaranteed without the adoption of any further measures. Where necrotic tissue was present, however, it was powerless, as contact with sound tissue alone was able to set free the formalin. In order to render it serviceable in such cases a means must be discovered of setting the formalin free outside the body, and such a means has already been found by the author in a peptic acid solution (pepsin, 5 parts; hydrochloric acid, 0.3 part; distilled water to 100). The powder with which the wound is powdered requires moistening with the above pepsin solution. The mode of preparation of the formalin gelatin is given by the author.

The fact that when the gelatin was enclosed within the system it became eventually completely replaced by connective tissue led the author to still further experiments. These led to the conclusion that formalin gelatin, being procurable in any shape, and on being heated capable of being moulded to any form, it might be employed for the plastic connective tissue closure of defects of all kinds. Impregnated with lime salts, it proved itself capable of replacing pieces of bone removed in the course of resection.—*Berlin Cor. Med. Press and Circular.*

THE

International Dental Journal.

Vol. XVIII. April, 1897. No. 4.

Original Communications.[1]

A CONTRIBUTION TO THE STUDY OF THE DEVELOPMENT OF DENTAL ENAMEL.[2]

BY R. R. ANDREWS, A.M., D.D.S., F.R.M.S.

The subject which I have the honor to present to you this evening is on the finer processes taking place in the formation of enamel. A renewed interest in this subject has been shown since the recent publication of a series of papers by Dr. J. Leon Williams, of London. These papers are notable largely on account of their beautiful illustrations.[3] There are many photomicrographs of developing enamel taken with the finest modern high-power objectives, and photographed with a skill I have seldom seen surpassed. The story they tell is one that is very familiar to me, and I can endorse every point in the development of the enamel that they show. With my present knowledge I cannot coincide wholly with the subject-matter of the text. Some of the theories advanced by this author are new to the dental histologist.

In an address delivered at Atlanta, Georgia, in May last, before the American Medical Association, I criticised some of these con-

[1] The editor and publishers are not responsible for the views of authors of papers published in this department, nor for any claim to novelty, or otherwise, that may be made by them. No papers will be received for this department that have appeared in any other journal published in the country.

[2] Read before the New York Institute of Stomatology, January 5, 1897.

[3] The original negatives of the illustrations of this paper were broken during transportation some time ago. These have been copied from lantern slides, and do not show the structure as clearly as the originals.—R. R. A.

clusions, they representing, as I believe, only partial truths. If the author had been as cautious in the preparation of his series of papers as he afterwards was when answering an imperfectly printed abstract of my paper, containing type-writers' and proof-readers' blunders, the probabilities are there would have been less occasion for criticism. That there are mistakes and misinterpretations in his text is plainly evident to any one who understands the subject; but there is enough of value in this series of papers to make the whole dental profession his debtor, for the large amount of work he has performed and for the time he has devoted to the interests of our education. When considering the appearances of the tissue while studying enamel development it seems important that we should bear in mind the fact that we are necessarily compelled to use post-mortem tissue. We should work as near life as possible, preparing the tissue while it is yet warm from the mother, never allowing it to become dry, cutting our sections under fluid, and mounting them for study with very little further preparation. In studying these finer processes with the use of the higher powers of the microscope it is seldom necessary to stain the sections. They show their structure beautifully without stain. It will be a revelation to those working by the older methods to study tissues prepared in this simple way.

We will now ask your attention to the origin of the blood-supply to the enamel organ. We have been given to understand that there is an intricate plexus of blood-vessels developed in the enamel organ proper. Let us clearly understand this. The term "the enamel organ proper" describes it when the organ is in its perfected state, before calcification commences. It is at this time a kind of storehouse, having within the meshes of its so-called stellate reticulum enough calcific material to form the first layer of enamel. Its contents are wholly epithelial. I question how a plexus of blood-vessels—a connective-tissue structure—can be developed in this epithelial mass. Wedl, Magitot, Legros, and Sudduth have all failed to detect any within the enamel organ proper. Just at this time there are indications of folds of tissue like papilla and a forming plexus of blood-vessels in the connective tissue of the jaw over and entirely outside the enamel organ. These folds, I have supposed, were to be taken up by the expansion of the part by growth. Just outside of these folds, or papillæ, is seen a forming plexus of blood-vessels which is eventually to give the blood-supply to the enamel-forming layers. This is all outside of the enamel organ proper, and there exists between it and the stratum inter-

medium of the outer surface the cells of the external epithelium of the enamel organ. This layer afterwards disappears, and as calcification advances the plexus of blood-vessels is found to be against, and sometimes within, the stratum intermedium, which, with the ameloblasts, now become the enamel-forming layers. A plexus of blood-vessels has never been seen in the internal portion of the enamel organ proper.

Tomes's edition of 1876 says the outer surface of the enamel organ is indented by numerous papillary projections, into which enter blood-vessels; and Lionel Beale stated, thirty years ago, that a vascular net-work lies in the stratum intermedium. This was also seen and described in the developing tooth of the rat by Professor Howes and Mr. Poulton, two English observers, some years ago; but this, I believe, was after the enamel organ had disappeared from over the calcifying tooth-point.

The origin of the blood-supply is from the connective tissue. Salts of lime are given out or selected from the blood. Enamel, an epithelial structure, thus has its lime-supply from a connective-tissue source. The statement has been made that the blood-vessels are often seen to lie very near the ameloblasts, but never are found in actual contact. Dr. Sudduth states that it is *absolutely essential* that the capillary vessels should come in contact with the enamel cells before the process of calcification can be completed. I do not think that Dr. Sudduth meant the cells of the stratum intermedium, for he gave them another function, that of supplying new cells to the ameloblasts as the circumference of the enamel increases.

I shall next call your attention to the tissue Dr. Williams proposes to name the outer ameloblastic membrane. With my present knowledge I cannot consider this layer a membrane. In his reply to a criticism of mine in my address at Atlanta (November *Dental Cosmos*), Dr. Williams states, "I thought I made it clear in my paper that I was aware this appearance had not only been long known, but that it had also long been the subject of dispute and speculation." Does he make it clear? What did he say in his paper about this layer? (*Dental Cosmos* for February, 1896, p. 108.) "Thus we see we have a clear, sharply-marked, and differentiated line separating these two layers of cells (ameloblasts and stratum intermedium), which have *heretofore always been represented as closely connected.*"

I have recently investigated this "sharply-marked and differentiated line." It is not always constant. Where it does exist, it

has the appearance of being a collection of fibres, and within the meshes of these fibres we find an accumulation of protoplasm, condensed, perhaps, by a post-mortem change, and this gives the appearance of a layer.

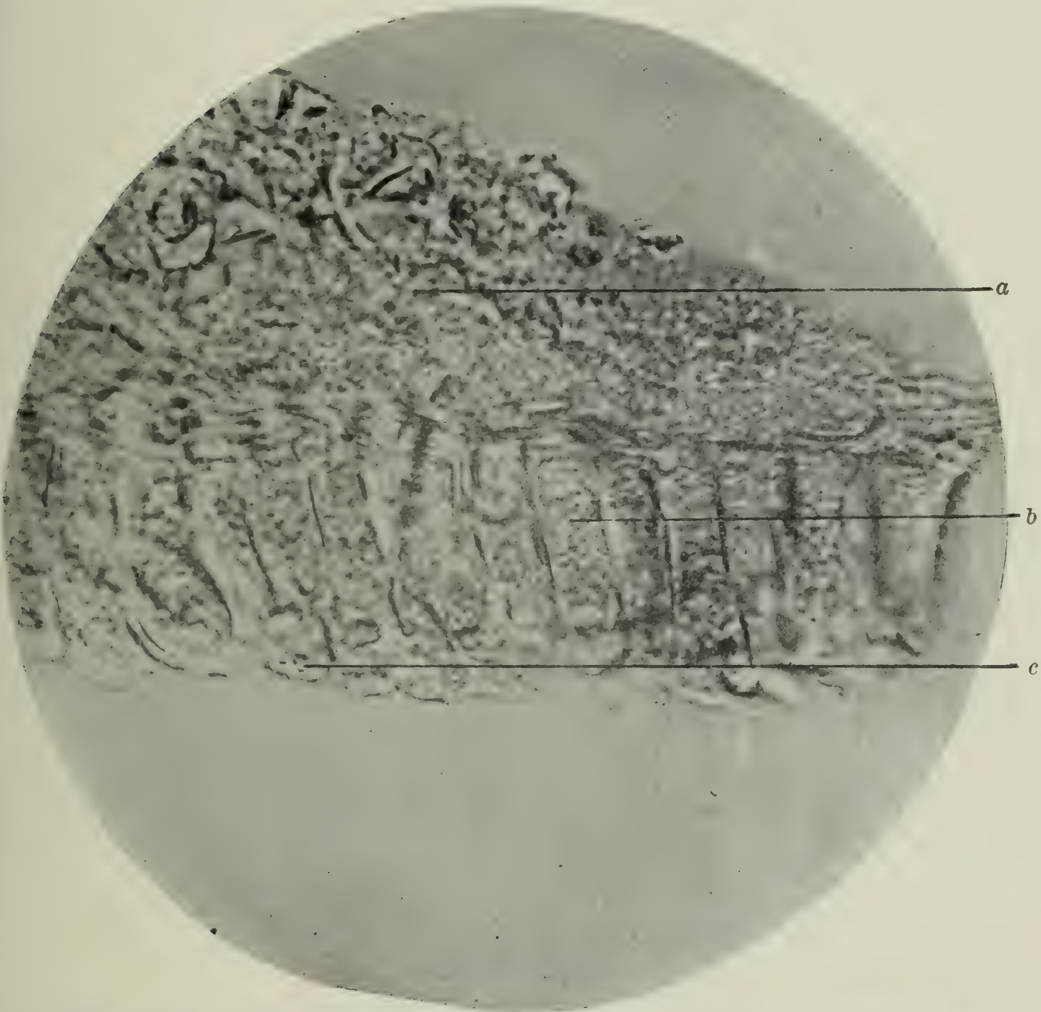
It is a disputed point whether fibres take their rise from a direct differentiation of the protoplasm, or whether this protoplasm is not converted into a homogeneous matrix from which the fibres differentiate. There can be no doubt but that the fibres are formed by a metamorphosis of the protoplasm, but I do not think they form within the cells. These fibres are formed, probably, from epithelial protoplasm. At various points they are connected with the ends of the cells of the stratum intermedium, on the one hand, and run into and between the ameloblasts on the other; and this was the appearance that gave me the impression that they had their origin from the stratum intermedium. Sometimes it is difficult to find any appearance of a layer; we see nothing but fibres; again it is quite marked, and in this condition it perhaps resembles a membrane. It is possible that the epithelial protoplasmic fibres which I described in my paper of 1890 have their origin here.

In regard to that structure called "the inner ameloblastic membrane," a structure between the ameloblasts and the formed enamel, he says, "It is impossible at present to speak definitely with regard to its origin, exact structure, or function. . . . It is possible that it plays an important part in the elaboration of material for enamel-building." This I am inclined to think is a mistake. The layer is an elaborated structure, a formed material consisting of a densified epithelial protoplasm; the substance that is to form the inter-enamel rod cement, and the calcific globular structures that are to form the enamel rods, together with the epithelial protoplasmic fibres which form the scaffolding that supports them. It is to all intents and purposes a formed material which further calcification will solidify into calcified enamel. As Dr. Sudduth has said, "Living matter cannot enter into chemical combination with inorganic matter as such, except the living lose its living principle and become non-living, formed material.

The layer is found to vary in thickness, sometimes being quite narrow, sometimes as thick as the layer of ameloblasts. These appearances show the various stages of the growth in the layer at the time when the section is cut. It is constant throughout the entire period of enamel growth. It seems impossible for us to understand why this fact should give a decided negative to the theory that ameloblasts are renewed from the stratum intermedium,

as stated in the *Dental Cosmos* for February, page 111. It is probable that the allusion was meant for the so-called outer ameloblastic membrane, while describing the so-called inner one. I am led to believe that the appearance of membranes in both these layers is due to the fact that the protoplasm has condensed and jellied into

Fig. 1.

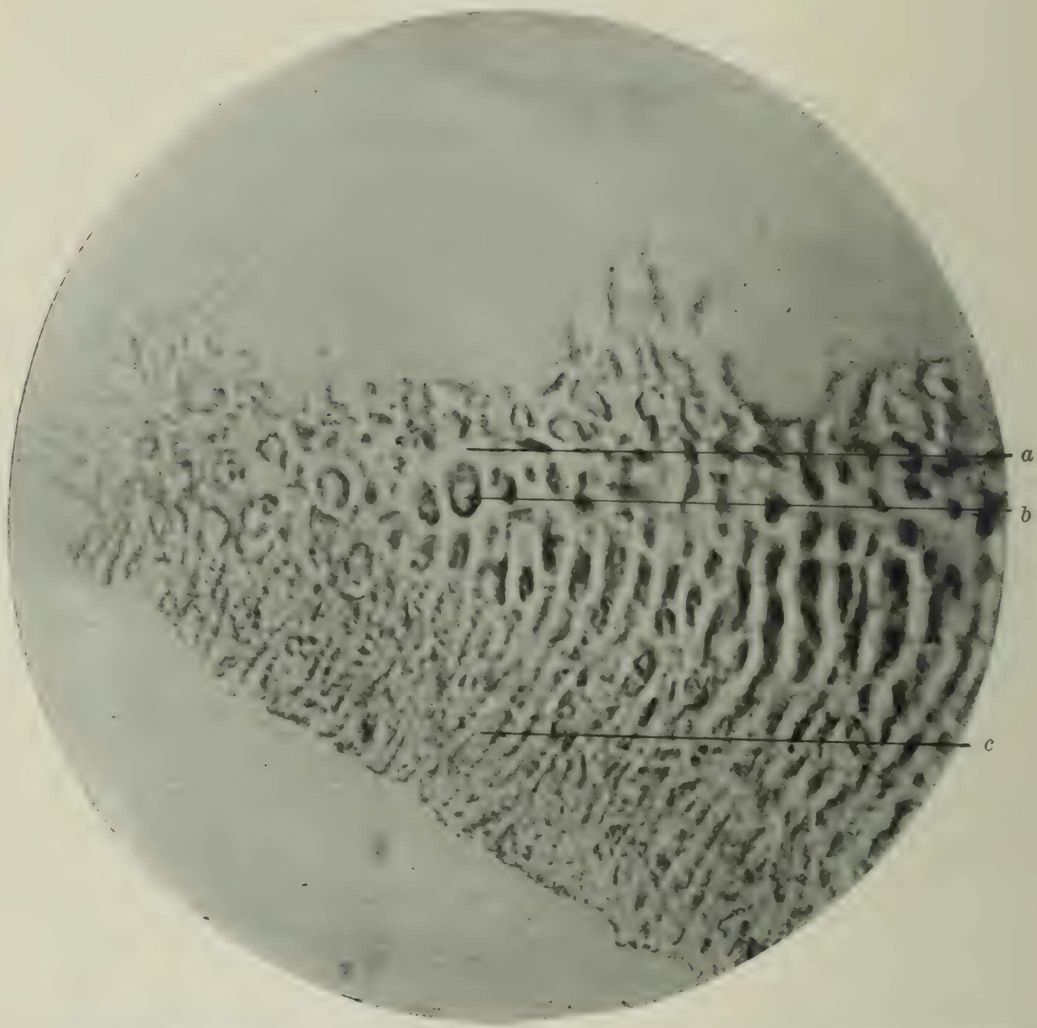


Section of tooth of calf, showing ameloblasts, also showing the minute globular bodies, calco-spherites, within the cells. There is no appearance of inner or outer membranes.—*a*, connective tissue of the jaw; *b*, ameloblasts containing calco-spherites; *c*, globular bodies, enamel globules.—Zeiss, 2 mm. objective, No. 12 eye-piece.

a line by reason of a post-mortem change within the meshes of the fibrous structure of each, causing the appearance of a discreet substance which shows a definite chemical reaction to the presence of certain stains. This inner layer is the so-called membrana præformativa of the earlier histologists. It is a partially calcified matrix material, somewhat resembling the substance we find every-

where on the border-land of calcification. It is seen occasionally in the first layers formed to double up on itself in folds, perhaps an excess of substance formed, to be smoothed out in the expansion by the growth of the dentine germ, when it will cover it as a single layer. I shall show this in my lantern exhibit.

Fig. 2.

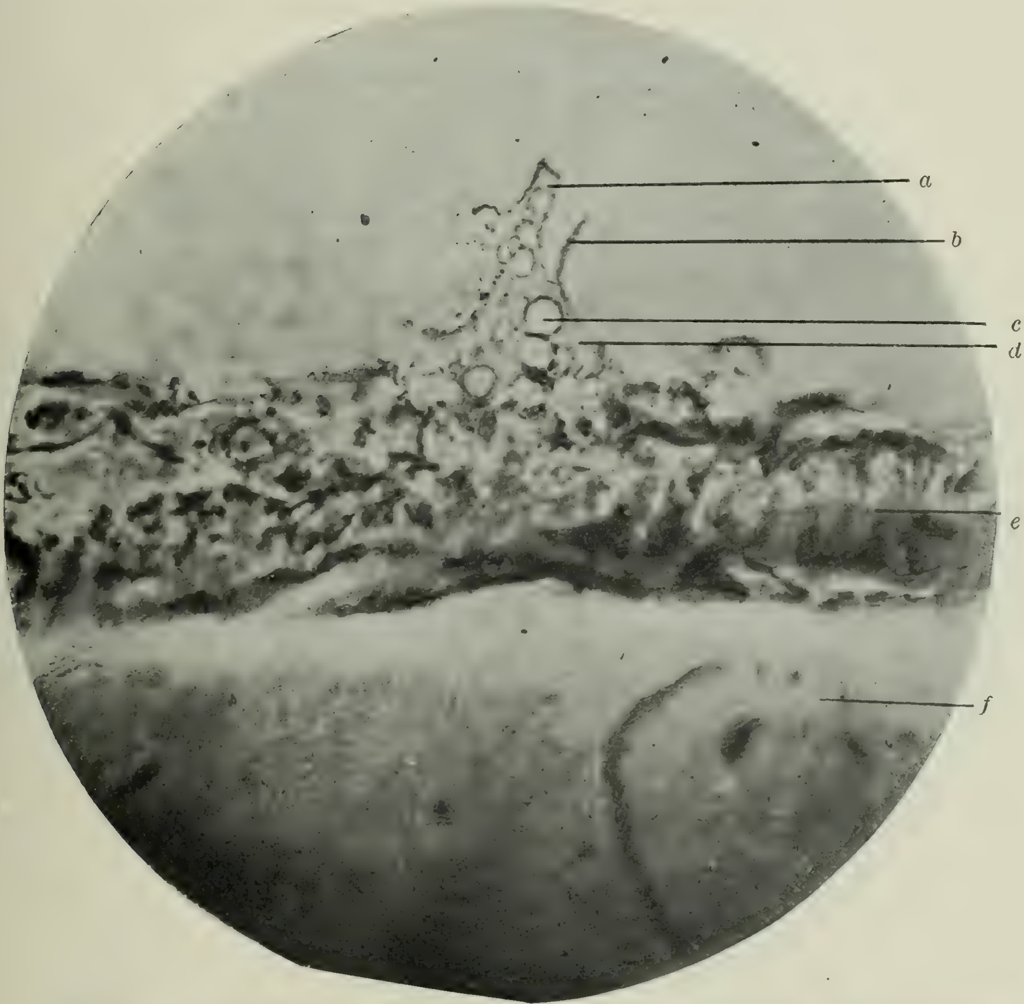


Section of forming enamel (calf), showing the transition from globules into enamel rods. High power.—*a*, protoplasmic exudate, cement substance between the globules; *b*, the globular masses; *c*, the forming rods of enamel.—Zeiss, 2 mm. objective, No. 12 eye-piece.

In these papers there is given to the stratum intermedium as important a function, perhaps, as that which belongs to the ameloblasts. The stratum intermedium is a layer of cells between the ameloblasts and the stellate reticulum in the enamel organ proper, and later between the ameloblasts and the connective tissue of the jaw of the enamel-forming layers. In the early stages of enamel-for-

mation I have considered this layer one of much importance, but I have not considered it as important a factor in the formation of the enamel as the ameloblasts. There can be no doubt that lime-salts from the blood are selected by these cells, but there is no

Fig. 3.



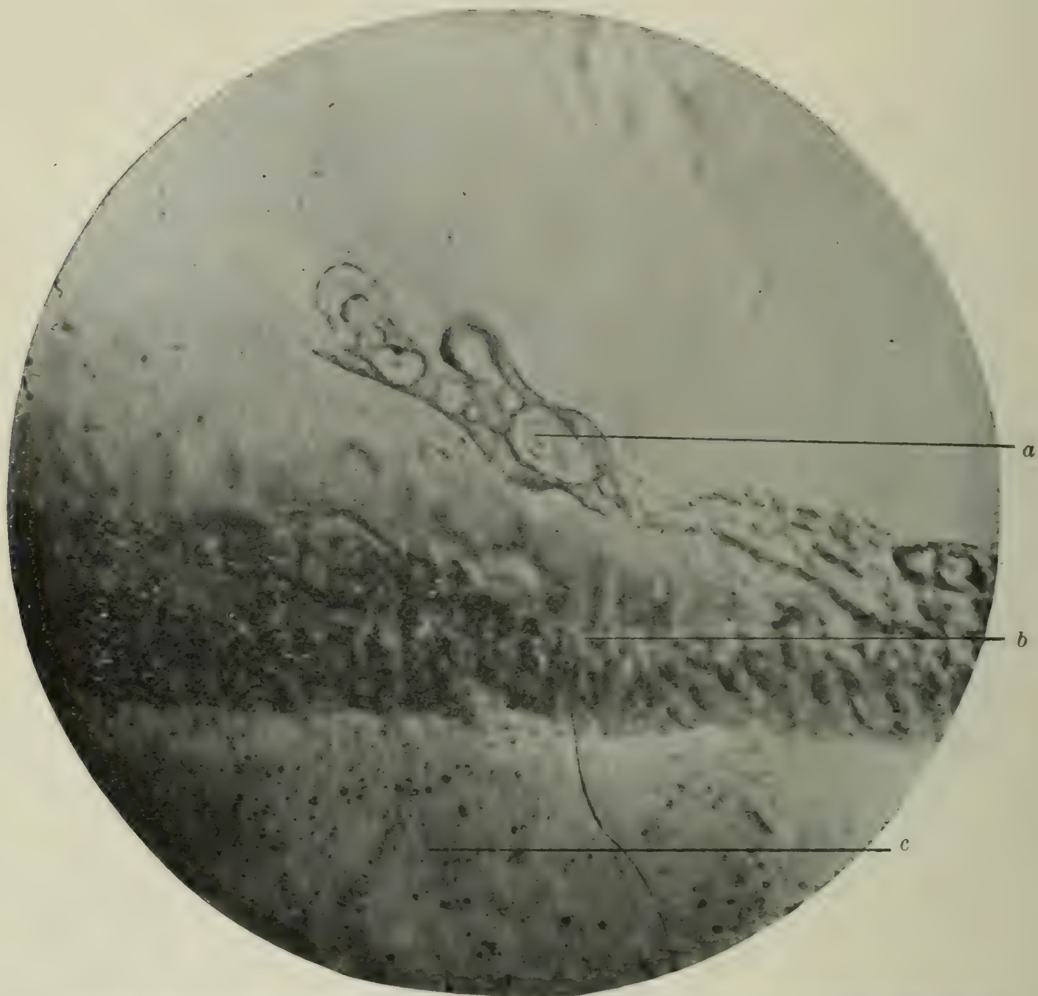
Section of developing enamel (calf), showing portion of ameloblast containing calco-spherites, and globular bodies that are to form an enamel rod. It also shows the protoplasmic exudate, cement substance, surrounding the globular bodies.—*a*, part of ameloblast containing calco-spherites; *b*, portion of a fibre; *c*, globular bodies, forming a rod; *d*, protoplasmic exudate, cement substance; *e*, forming enamel; *f*, dentine.—Zeiss, 2 mm. objective, No. 12 eye-piece.

optical evidence of any important chemical change towards forming calcific globules until it is absorbed in the protoplasm of the ameloblasts, which is really the enamel-builder. Quite recent investigation has led me to believe that protoplasm from the cells of the stratum intermedium may be deposited between this layer and the

ameloblasts, and that this protoplasm becomes a tissue from which epithelial fibres are differentiated.

The ameloblasts, by a peculiar metamorphosis, have become specialized epithelial cells. In this condition they are unlike many other cells, being unable to lead an independent existence. They

FIG. 4.

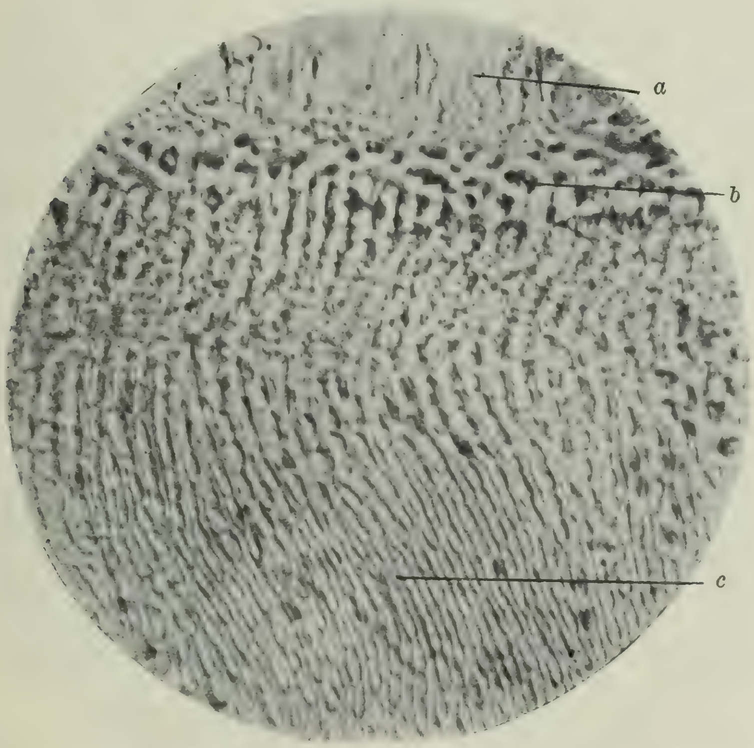


Section of developing enamel (calf), showing globular bodies in the inter-rod cement substance, the large mass was caused by the coalescing of smaller ones, from the pressure on the cover glass of the specimen after mounting.—*a*, large globular mass in cement substance; *b*, forming layer of enamel; *c*, enamel formed.—Zeiss, 2 mm. objective, No. 12 eyepiece.

are cells without membranes at either end, and have rightly been called the modellers or builders of the enamel. The power of the protoplasm of these cells, with its formative activity, creates with the lime-salts of the blood bodies called calco-spherites. These are plainly seen to differ from the protoplasm, and by it they are placed so that they occupy a definite position, having a fixed form and

structure. It will thus be seen that the ameloblasts absorb the calcific material from the blood; perhaps this is done by the cells of the stratum intermedium, and the ameloblasts absorb it from them. At any rate, within the ameloblast it is elaborated and given up to the calcifying surface in an altered form. A calcareous matrix is not formed out of protoplasm alone, but the protoplasm plays the part of an intermediary, selecting the substance from its environment. There are no reasonable grounds for the hypothesis that the phenomena of nuclear segmentation (mitosis of karyoki-

Fig. 5.

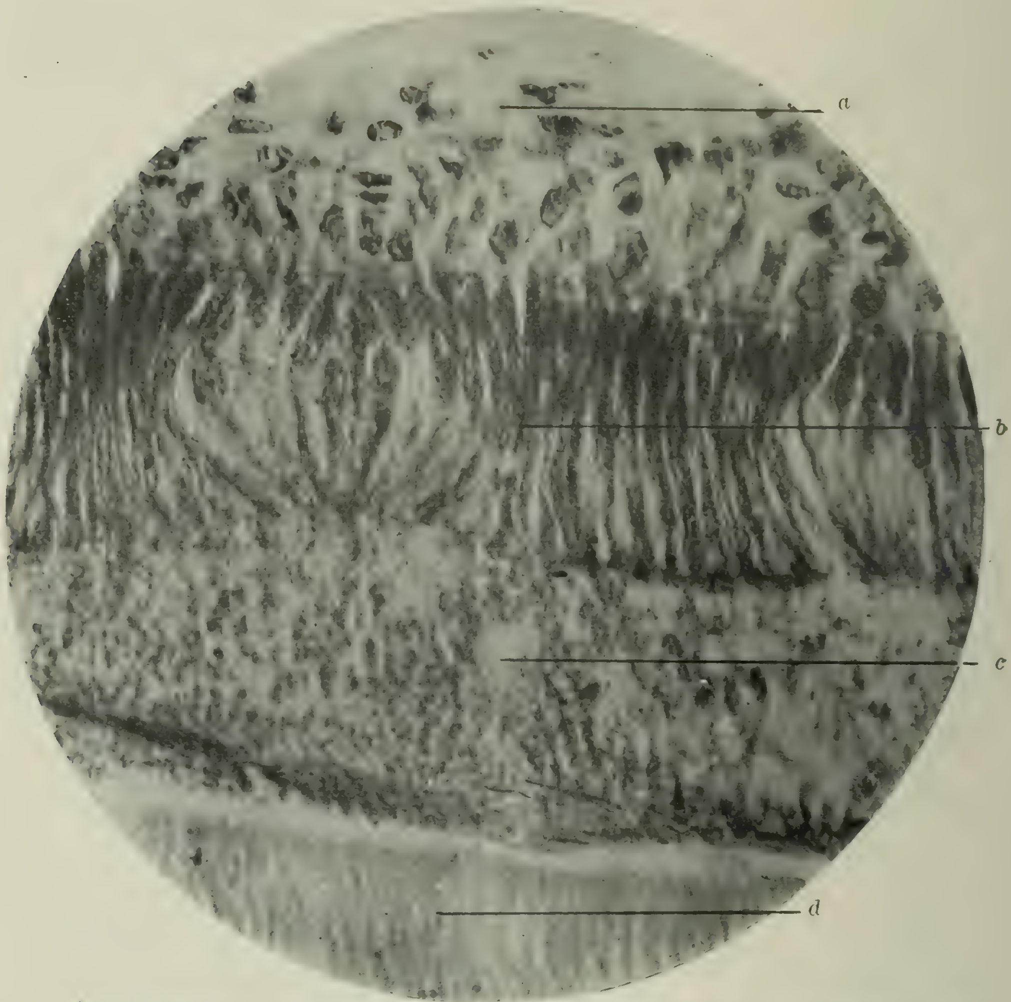


Section of forming enamel (calf), showing the transition of the globular bodies deposited by the ameloblasts into the rods of the enamel.—*a*, ameloblasts, torn away; *b*, globular bodies; *c*, the forming rods of enamel.—Hartnack, No. 9 objective, No. 2 eye-piece.

nesis) has anything to do with the forming of the lifeless, calcific substance which is to form the rods of the enamel. The phenomena which occur during nuclear segmentation are very complicated. Briefly, we may say in describing them that during the first stage the nucleus undergoes changes preparatory to division, resulting in the formation of nuclear segments and the nuclear centrosomes. At the same time the spindle commences to develop. During the second stage the nuclear segments, after the nuclear membrane has become dissolved, arrange themselves into a regular figure midway

between the two poles, at the equator of the spindle. During the third stage the daughter segments, into which during one of the former stages the mother segments have divided by longitudinal fission, separate into two groups, which travel in opposite directions from the equator until they reach the neighborhood of the

FIG. 6.

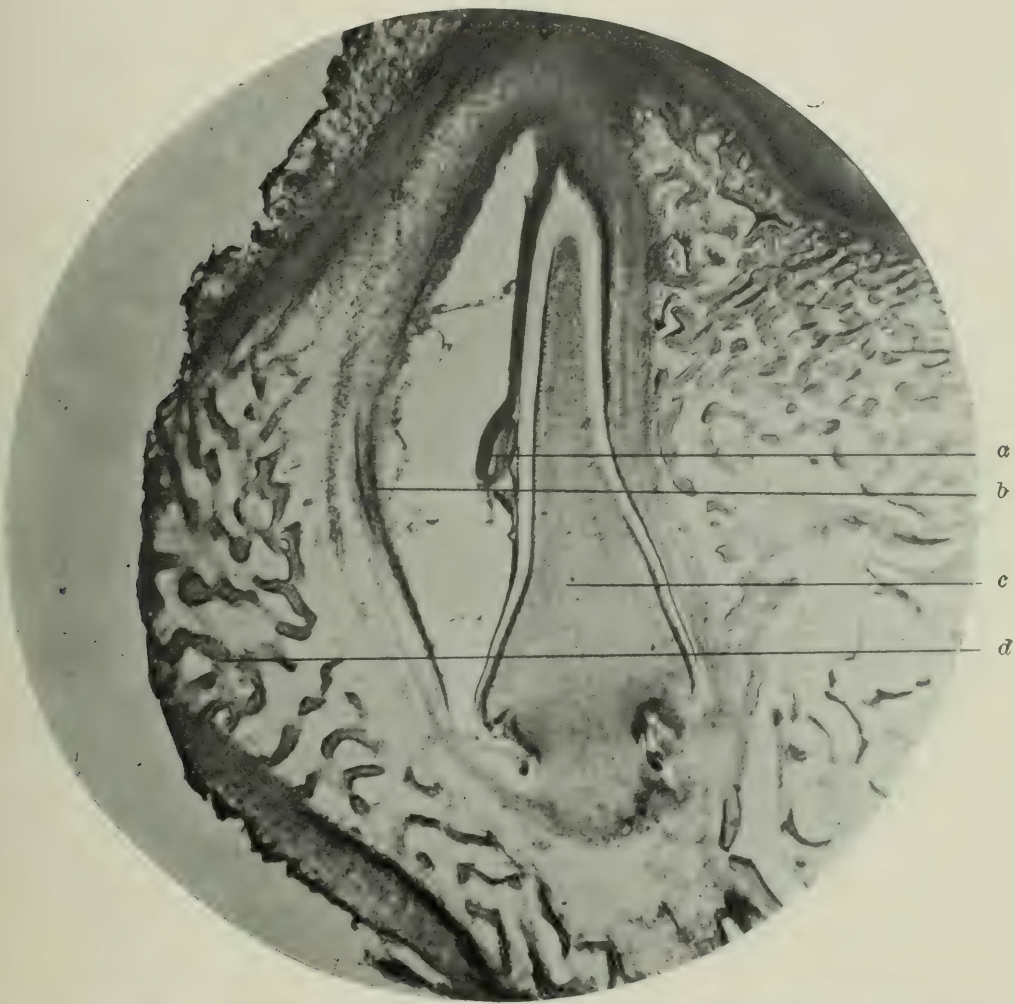


Section of developing tooth (calf), showing the forming layer of enamel as wide as the layer of ameloblasts.—*a*, connective tissue; *b*, ameloblasts; *c*, forming enamel; *d*, dentine.—Hartnack, No. 9 objective, No. 2 eye-piece.

centrosomes. During the fourth stage reconstruction takes place, vesicular resting daughter nuclei being formed out of the two groups of daughter segments, while the cell-body divides into two daughter cells. (From "The Cell," by Dr. Oscar Hertwig, 1895.) The manner of forming the "globular organic matrix" that Dr. Williams claims may be formed by the nucleus is here shown to be the process of the formation of new cells by nuclear segmentation.

These cells are formed to supply those that are necessary to cover the larger circumference of the enamel as it forms. I had formerly supposed, with many others, that new cells were supplied from the cells of the stratum intermedium. There are appearances which indicate this. But my recent investigation proves to my mind that

FIG. 7.

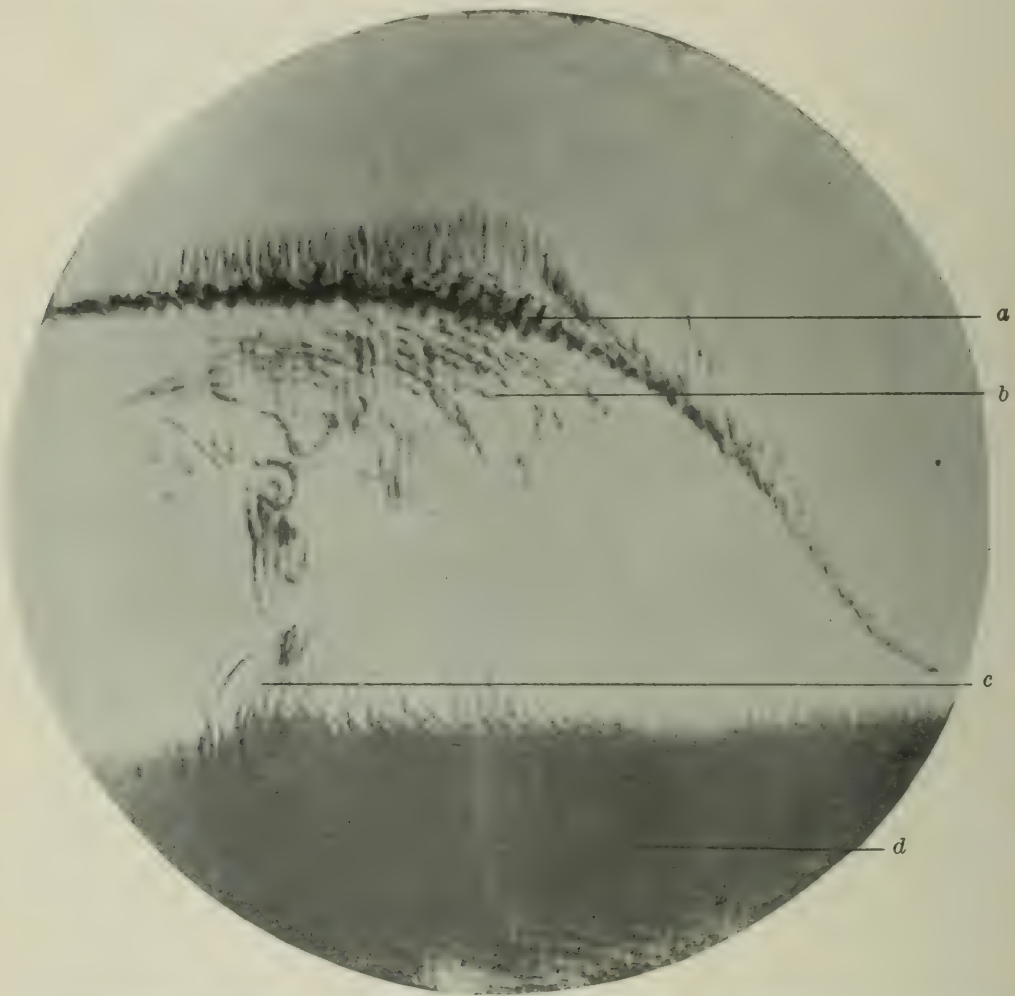


Section of developing tooth of pig, showing a layer of enamel substance folded over upon itself. The enamel cells have been teased away to show the fold.—*a*, fold of enamel substance; *b*, enamel cells, ameloblasts; *c*, developing tooth; *d*, developing bone of jaw.—Tolles, half-inch objective.

new cells needed in the ameloblastic layer originate wholly within the nucleus of the ameloblast. The new hypothesis, that the "globular organic matrix" which is to form the enamel rod has its origin from the nucleus, is probably altogether impossible. This statement is cautiously made. I have given the matter considerable attention, and have consulted several prominent biologists.

This globular, calcific matter is formed material. That which is formed by the nucleus of these specialized cells are *living daughter cells.* The power of the protoplasmic body to create different structures from the lime that it absorbs has more to do with the formation of these masses than the nucleus. It takes possession of

Fig. 8.



Section from developing tooth (human), showing the fibrous structure of the so-called "inner ameloblastic membrane."—*a*, a fibrous structure in which the enamel globules are deposited; *b*, *c*, enamel fibrils which form the substructure or scaffolding; *d*, formed enamel. —Hartnack, No. 9 objective, No. 2 eye-piece.

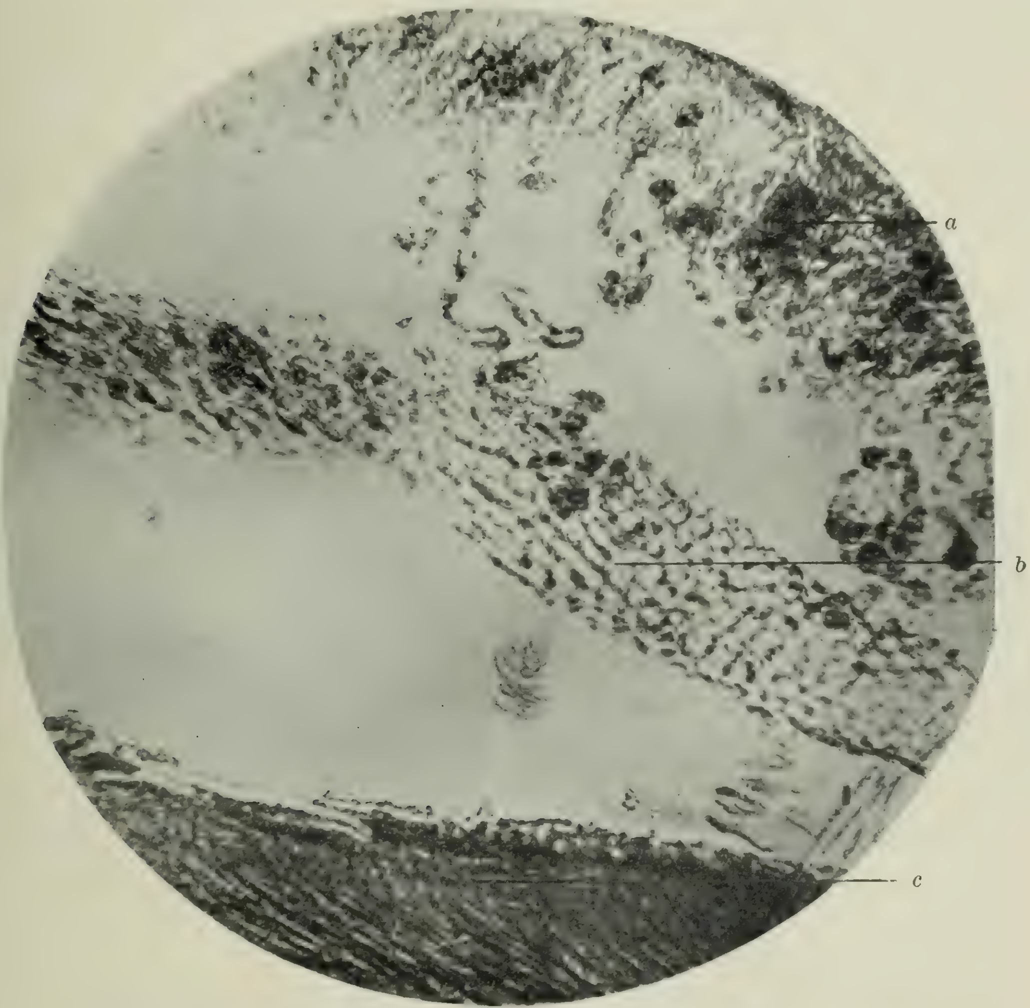
the lime-salts, forms them into calcific globules, and deposits them in the case of enamel calcification upon the outer surface of its calcifying structure.

In describing the probable origin of the enamel globule the following statement is made by Dr. Williams:

"It is not impossible that these bodies are of the same nature as

the paranucleus or nebenkern of recent investigators in the field of cell mitosis." It is *not* probable that these investigators have studied the subject of cell mitosis from the specialized cells we call the ameloblasts. The term paranucleus or nebenkern is not used for the nucleus, but for a body, which is new, found in the develop-

FIG. 9.



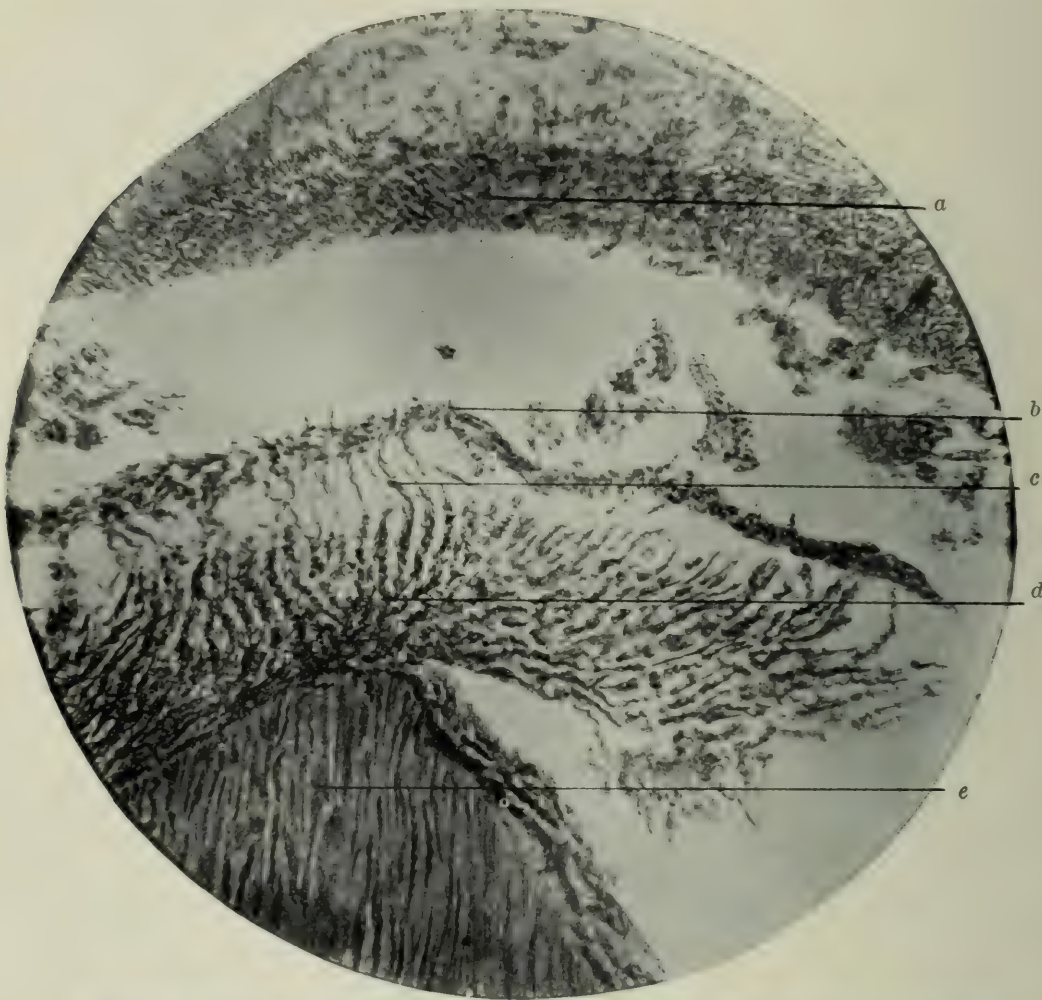
Showing the first layer of enamel formed. The so-called "inner ameloblastic membrane." This is not a membrane. It is composed of a fibrous substructure in which the enamel globules are placed.—*a*, ameloblastic layer; *b*, substructure or scaffolding of fibres; *c*, dentine.—Hartnack, No. 9 objective, No. 2 eye-piece.

ment of spermatozoa, generally admitted to be formed from the remnants of spindle fibres after the last act of cell division preceding the formation of spermatozoon. It has also been used for other things. In this connection I offer a terse statement from a biologist of world-wide reputation, who writes, "In general I doubt the origin of many things which have been supposed to be

budded off from the nucleus, and should want strong evidence to convince me that 'the globules' in question have thus originated."

We have thus briefly considered the source of the blood-supply, the so-called inner and outer ameloblastic membranes, the stratum intermedium, and the layer of ameloblasts of the enamel-forming

Fig. 10.

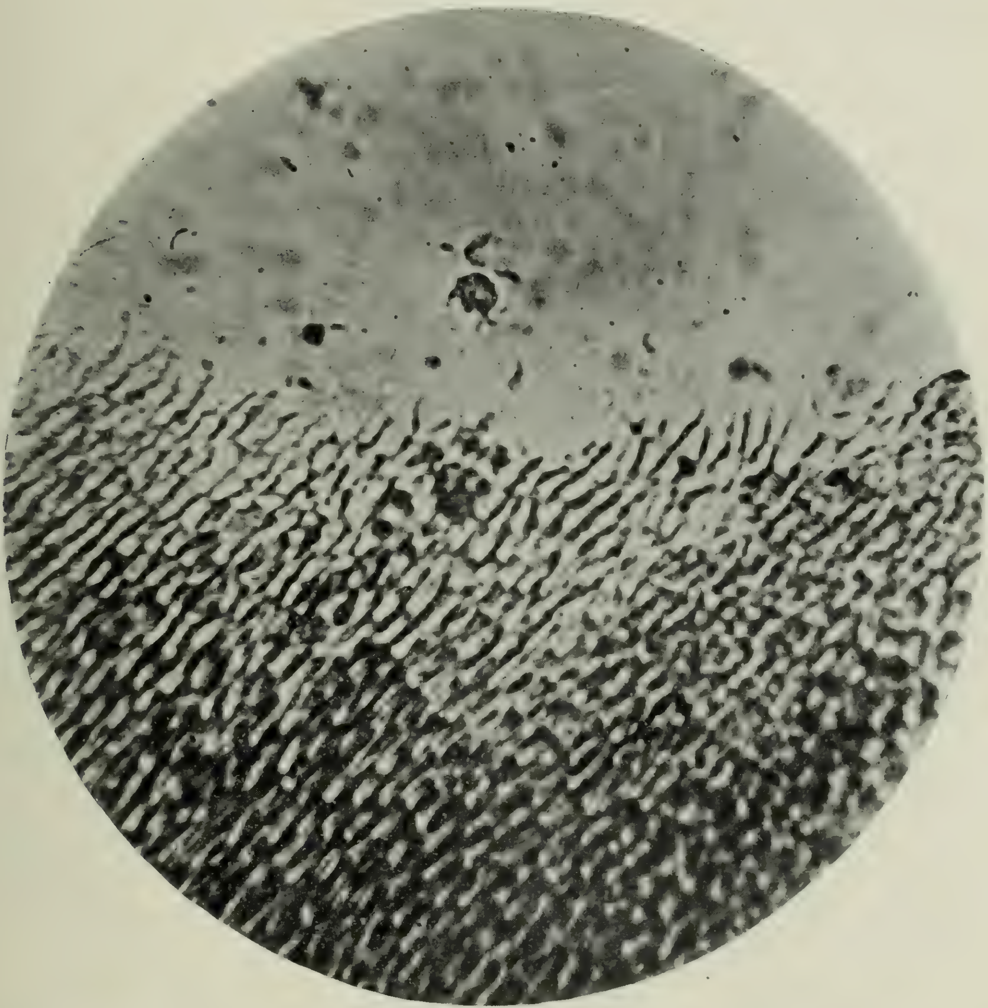


Section of forming enamel (human), showing the fibrous substructures.—*a*, connective tissue and stratum intermedium; *b*, the last formed layer of enamel, the so-called "inner ameloblastic membrane;" *c*, enamel fibrils, the substructure in which the globules are deposited; *d*, young enamel near dentine; *e*, dentine.—Hartnack, No. 9 objective, No. 2 eye-piece.

layers. I shall now ask your attention to the consideration of the structure of the youngest layer of enamel as it is formed before its full calcification. There is a period of growth here that has been but briefly considered. To me it is an important period, being that between the formation of the masses and of their becoming calcified into the enamel rods. It shows the transition period. It is doubtful

if these stages of growth could be shown by the usual method of preparing sections. The bodies of calcific material that are deposited are found not always to be globular, seldom in the form of disks, more often oval or block-shaped, with the corners rounded, and are almost always larger than the enamel rod that is afterwards

Fig. 11.

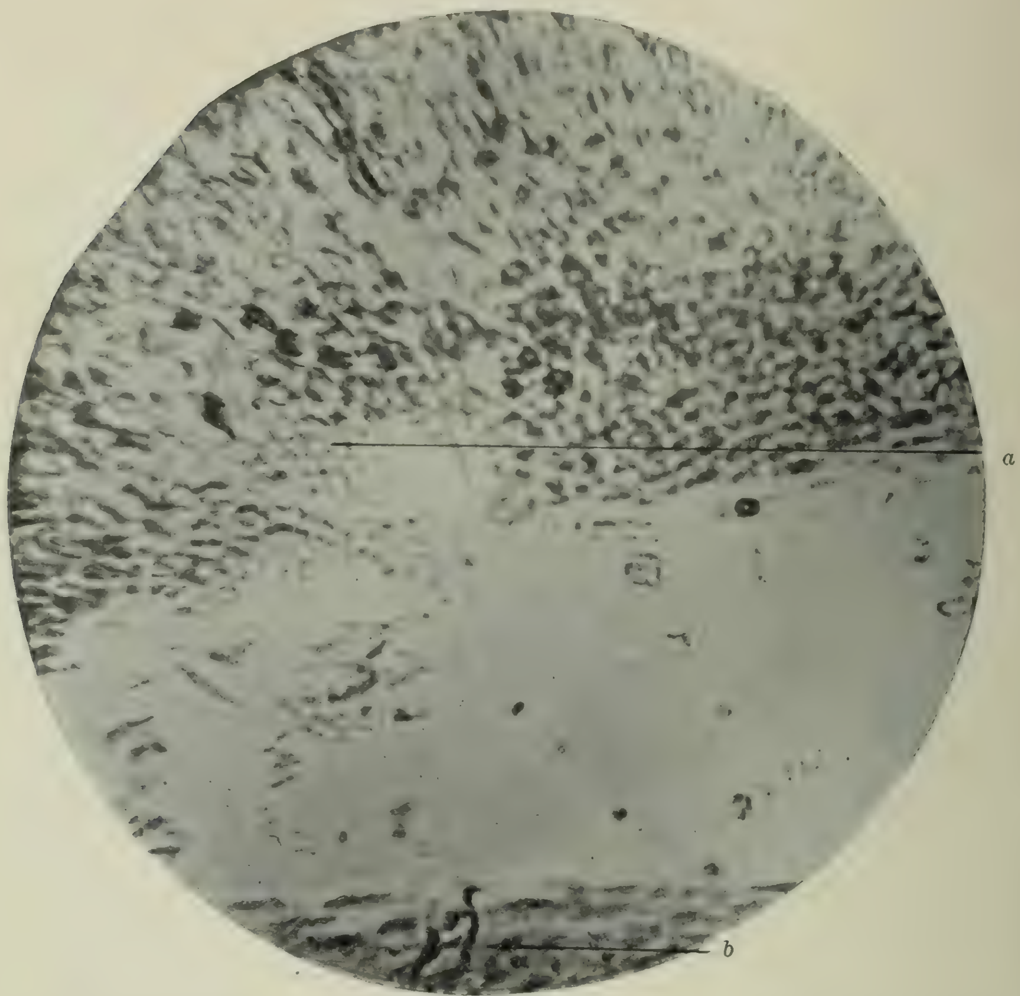


Section of forming enamel (calf at birth), showing a fibrous substructure, or scaffolding, into which the globules are placed. The fibres are here shown as standing out like the teeth of a comb, cement substance being calcified about them.—Zeiss, 2 mm. objective, No. 12 eyepiece.

formed from this substance. They are deposited within what appears to be a semifluid, protoplasmic substance. As stated in my Atlanta paper, I think it is more than improbable that there are two sets of globules, each of a different nature. There are two distinct products, both of the same nature. They only differ morphologically. One is globular, the other fluid, each a somewhat

different chemical combination not yet understood. If we wish to examine the so-called inner ameloblastic membrane, a transition tissue, and have been fortunate in making our sections as near the life of the tissue as possible, we shall see by using our highest powers precisely what I have formerly described. The masses at

FIG. 12.



Section of developing tooth (human), showing the structure of the so-called "inner ameloblastic membrane." At *a* are seen the globular bodies of uniform size and in orderly deposit; these are to form the enamel rods.—*a*, globular bodies forming rods; *b*, dentine.—Hartnack, No. 9 objective, No. 2 eye-piece.

the point of calcification are mostly oval or block-shaped, surrounded by a semisolid substance, which has been formed by the protoplasm of the ameloblast. This inter-rod cement is not formed by the globular masses, as recently stated. As the enamel globules are placed near the point of calcification, they are found to be somewhat larger than the rod they are to form. By some power they

seem forced inward against the portion calcified, as if undergoing some sort of compression. Each mass is as yet separate from one another, with the semisolid cement substance around and between it. If this young enamel should now be teased away from the layer of ameloblasts, we should see where the epithelial fibres are. They stand out from the section somewhat like the teeth of a comb, but are so covered with the protoplasmic cement substance, which is partially calcified, that it masks them, and it is somewhat difficult to distinguish them as fibres; but they are too regular in their arrangement to be accidental formations, caused by the pulling out of calcific matter to form plasmic strings. If we examine another section, showing the enamel-forming layers, this transition layer, and the formed dentine, we shall find what appear to be fibres spanning any space from the ameloblasts to the formed dentine, in a regular, systematic order, as I shall show you this evening. The so-called plasmic strings, I am led to believe, are simply epithelial fibres. There is probably but little ground for the belief that they are formed by the protoplasm within the ameloblasts.

Let us now consider the substance that is called calcoglobulin, a name accepted by all investigators since the time of Rainey, Ord, and Harting. In his latest article, Dr. Williams, without any stated authority, says, "It has been pretty conclusively shown to be *not* calcoglobulin." He goes on to say, "Let not Dr. Andrews make the mistake of supposing that the experiments of Mr. Rainey, Dr. Ord, and Professor Harting have settled the problem of dentine and enamel formation. They are to be accepted for just what they are worth, and no more, and they fall a long way short of a complete explanation of the formation of these tissues in the living organism." This assertion is contrary to all the authorities of which I know. Professor Sudduth, whose opinion I value second to none, puts the matter in a different light when he says, "Mr. Rainey has by many and thoroughly scientific tests proved the analogy between his artificial calculi and those formed in the body. The lime-salts are deposited in both cases in a gelatin matrix. . . . The difference between crystallization outside of the body and crystallization within it is due to the action of the specially endowed cells. . . . On the border-land of calcification, between the completely fully calcified tissue and the formation matrix as yet unimpregnated with lime, there very constantly exists a stratum of tissue which in its physical and chemical properties very much resembles calcoglobulin." And again, "The secreted salts of calcium, which are thrown out by the cells, enter into chemical

combination with the peripheral layer of protoplasm and form calcoglobulin, which, as we have before shown, is insoluble in acids."

Tomes says of it, "It belongs to that class of peculiar resistant substances which are to be found on the borders of calcification, and it behaves very much like Professor Harting's calcoglobulin." One can hardly expect us to accept Dr. Williams's unsubstantiated assertion until after it has been proved by careful and thoroughly scientific experiments. Does this authority wish to stake his reputation as an histologist on what he has said about calcoglobulin? I think not; his position cannot be an intentional one at all. It is probably the result of giving too little thought to a somewhat difficult subject. This appears on pages 126 and 127 of the *Dental Cosmos* for February, 1896, where, speaking of calcoglobulin, he says, "It is possible, and I think highly probable, that this substance, although appearing in the ameloblasts, is really formed in the more specifically secreting cells of the stratum intermedium." One who knew anything about the substance could hardly have made such a statement. Calcoglobulin is formed only at its point of calcification. See all authorities.

Another statement, on page 297 of the *Dental Cosmos* for April, 1896, is equally as carelessly made. It is where this statement occurs: "The larger, more transparent, and irregularly sized bodies of calcoglobulin [the term is not used "provisionally and with mental reservation" here] melt or flow together to form the interprismatic substance." Mark what follows. "This substance is more quickly destroyed by acid treatment than the enamel globules."

Authorities tell us that the line of calcoglobulin is held in some sort of chemical combination, for the last traces are retained very obstinately in this tissue, and it becomes exceedingly resistant to the action of acids, caustic, alkalies, and boiling water. This statement would prove to most of us that the globules spoken of which were not destroyed by acid strongly resemble calcoglobulin, while the material which he wrongly named calcoglobulin was easily destroyed. In that portion of the ameloblast farthest away from the calcifying enamel, calcific matter is being elaborated by mingling with the protoplasmic fluids. It is in such fine subdivisions that it is not often visible, even with our highest powers. A little lower in the region of the nucleus we have an ocular demonstration of it in the form of minute globules of calcific matter. These have been named calco-spherites, and they appear to enlarge not by growth, but by a process of coalescing, becoming larger as they are con-

veyed by the living matter of the cell to the region of the calcifying enamel. Here they are found to have coalesced into their typal form, very nearly of uniform size. At these times they are not the substance we call calcoglobulin. At the point of calcification they undergo an unknown chemical change of a calcifying nature. They become then a transition tissue,—a tissue that is seen on the borderland of calcification. It is exceedingly resistant to the action of acid, and is known to most authorities as the substance called calcoglobulin.

I see little in the third paper, in the *Dental Cosmos* for June, 1896, on formed enamel that I cannot heartily endorse, except the hypothesis advanced that the substances in the form of globular and block-shaped calcific masses which form the rods may have their origin from the nucleus, or that the plasmic strings have their origin within the protoplasm of the ameloblast. The following paragraph from Dr. Williams's text is an excellent word-picture: "If one were to make an elaborate pattern in clear glass, and then embed this pattern in other glass of lower melting-point, the problem of differentiating the pattern in clear glass would closely resemble the problem of differentiating the structure of completely formed enamel, and this illustration represents fairly well the manner in which enamel is formed. A somewhat elaborate pattern of translucent material is formed by the enamel cells."

This translucent material spoken of represents the substance of the enamel globules, which, by forming one over the other, will become the rod,—that is, by successive deposits.

Continuing, he writes, "Simultaneously or alternately with the formation of this pattern, another translucent substance of a more liquid character is formed, which flows or melts together all about the pattern-work, and the two become calcified together."

This translucent substance spoken of has in previous papers been mistaken for calcoglobulin, which it certainly is not. It represents the protoplasmic exudate from the ameloblasts that flows around the globules which are forming the rods, and becomes calcified as the cement substance. With these modifications, I can agree to the above statement. I am led to believe that the appearance of minute globular bodies within the calcified columns of the formed enamel, as seen in the illustrations in th June *Dental Cosmos*, are a form of arrested development. In sections of what appear to be enamel of finer structure we do not see these appearances. This third paper is of much value, and the illustrations are very beautiful. They show no structure with which I have not been somewhat

familiar for many years. The structure, as seen in Fig. 82, I have demonstrated in all my lantern exhibitions since 1889.

In conclusion, I would say I believe that the formation of the enamel is in a sense a secreting process, but I do not believe secreting papillæ have been found in the stratum intermedium in all cases. This remains to be proved by further investigations. I believe there are two distinct products of the enamel-forming layers; that one of these products, from which the enamel rods themselves are built, is formed in the ameloblast, but not by nuclear formation. In the formed enamel rod the globular bodies are nearly or quite melted into one another at their extremities.

As the globular bodies pass from the ameloblasts they are placed in a net-work of what appears to be epithelial fibres, which pass within, between, and across the globular masses. Around the scaffolding thus formed the protoplasmic exudate flows, thus supplying the cement substance. Calcification then takes place, and enamel is formed. I believe, with Tomes, that enamel contains very little, if any, organic matter when fully calcified, and with Dr. Williams, that the finest lenses will not reveal the slightest difference between enamel ground from a living tooth and that which has lain in the earth for centuries.

Views which I have expressed in this paper differ somewhat from those of Dr. Williams. That he has made a number of misinterpretations seems evident. It is true these points in question cannot be considered as settled; this is a progressive subject, and I should be the last to claim my interpretations as wholly correct. Still less would I wish to ridicule the views of those from whom I differ. Antagonistic interpretations are necessary to the life and development of all scientific questions, and the truths are sooner proved in proportion to the diversity of opinion expressed by the investigators. Many conclusions are one-sided, and continually need correction. If, as is natural, I have placed my own interpretations in the foreground, I can also fully appreciate the immense work Dr. Williams has accomplished. With better instruments and better methods future investigators may be able to clear up all of these disputed points.

THE DEGENERATE JAWS AND TEETH.[1]

BY EUGENE S. TALBOT, M.D., D.D.S.[2]

(Concluded from page 150.)

Modification of the V-shaped arch results from modification of the above-named conditions. A difference in the time of eruption of the cuspids, everything else being equal, effects a difference in the space left for their accommodation, and thus partial V-shaped arches (Fig. 55) are found. The key-stone, the cuspid, is not entirely outside or inside of the arch in the partial V-shaped form, but may appear partially crowded out of place. Hence the arch is neither a normal curve nor wholly angular, but unites the characteristics of both. Its lateral diameter is less than that of the normal arch, giving a contracted appearance. Thus a number of varieties of the fundamental forms of the V-shaped arch are formed, differing in degrees of anterior contraction. All of these result from the comparative thinness of the anterior portion of the process offering but little resistance, an abnormal pressure from behind, and the greater strength of the cuspids which cause them to seek room irrespective of the space left for them. When one side of the process near the symphysis is the stronger, thus affording greater resistance, or the pressure from the cuspid is less, that side may maintain its normal relations, while the other may give way to conditions resulting in a V-shaped contraction. The curve will then be broken not at the apex of the triangle, but near it, the incisors will overlap, and when pressure from the cuspid acts on the weaker column it must give way. This results in the semi-V-shaped form (Fig. 56). When the permanent bicuspids erupt under a favorable condition, so that their greatest diameter is in a line with the greatest diameter of both cuspids and first molar, they will be held firmly in place, since the greatest pressure is on this very line. On the other hand, when the bicuspids are erupted after their proper time, while the cuspids progress duly, the cuspids, meeting with no resistance, fall into their proper places, but the bicuspids adapt themselves as best they can to the space left for them, and if the arch of the maxilla does

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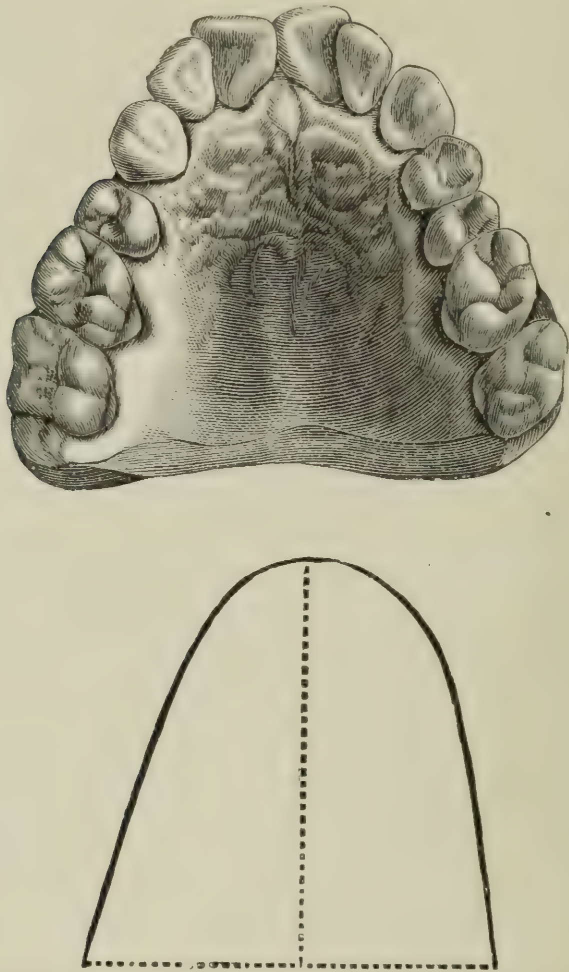
[1] Read in the Section on Neurology and Medical Jurisprudence at the Forty-seventh Annual Meeting of the American Medical Association, held at Atlanta, Ga., May 5 to 8, 1896. Reprinted from the Journal of the American Medical Association, by special request.—[Ed.]

[2] Fellow of Chicago Academy of Medicine.

not coincide with that of the crowns they must fall within or without the arch. Now, if the first molar has moved forward, diminishing the space, the bicuspids must erupt either within or without the arch.

To understand why they are generally found within the arch the shapes of the molar and cuspids must be kept in mind. A

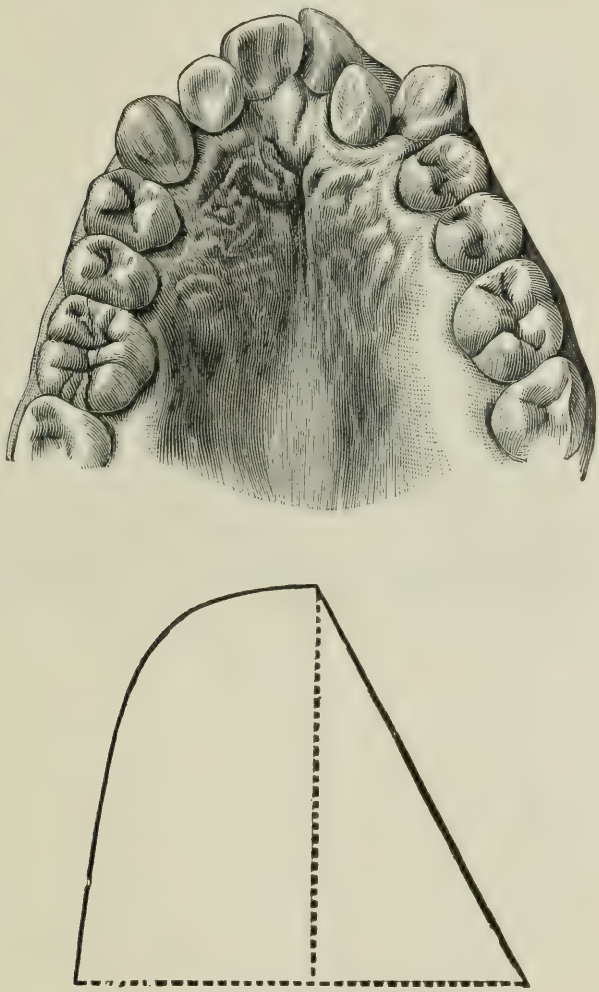
Fig. 55.



transverse section of their crowns shows their proximal walls not to be parallel but wedge-shaped, their diameter being greater on the buccal than on the palatal side. When the crowded bicuspid falls within the greatest diameter of these teeth, finding more room within the arch, they naturally slip in the direction of least resistance,—*i.e.*, towards the palate. A local cause for the same condition is found in the fact that the crowns of the bicuspids before their eruption are held between the roots of the temporary molars, and as these form an arch of a smaller circle than that of the perma-

nent teeth, the bicuspids will be found generally inside the arch. From both causes we have an inward curvature which we term the

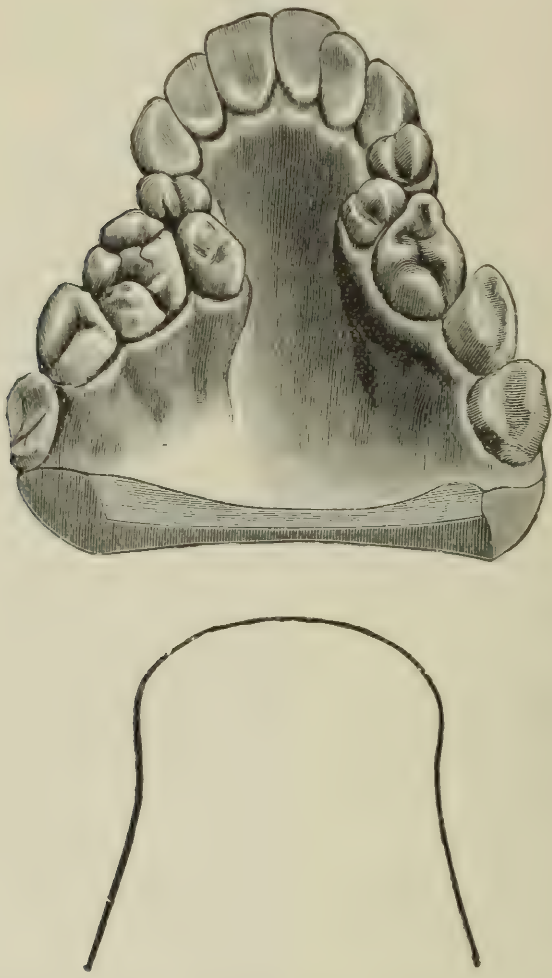
Fig. 56.



saddle-shaped arch (Fig. 57). It should be noted here that while the V-shaped irregularity is found anterior to the cuspid, the upper incisors are always projecting beyond the lower, the saddle-shaped irregularity is invariably posterior to the cuspid and the bicuspids form an inward curve. The incisors never project. Both forms contract the arch, the V-shaped anteriorly, the saddle-shaped posteriorly. In both forms the forward movement of the first molar is the local cause. When the unfavorable conditions that result in the saddle-shaped arch are not so pronounced we have the partial saddle-shaped arch (Fig. 58). Thus, because of the greater uniformity of the maxilla and of the arch of the crowns there may be more space and the bicuspids may be forced but little out of place,

or the molar may move forward but slightly, interfering less with the bicuspids. Sometimes it happens that in trying to adjust themselves to the limited space one bicuspid may be crowded outward and another inward. Sometimes the first bicuspid is in, more fre-

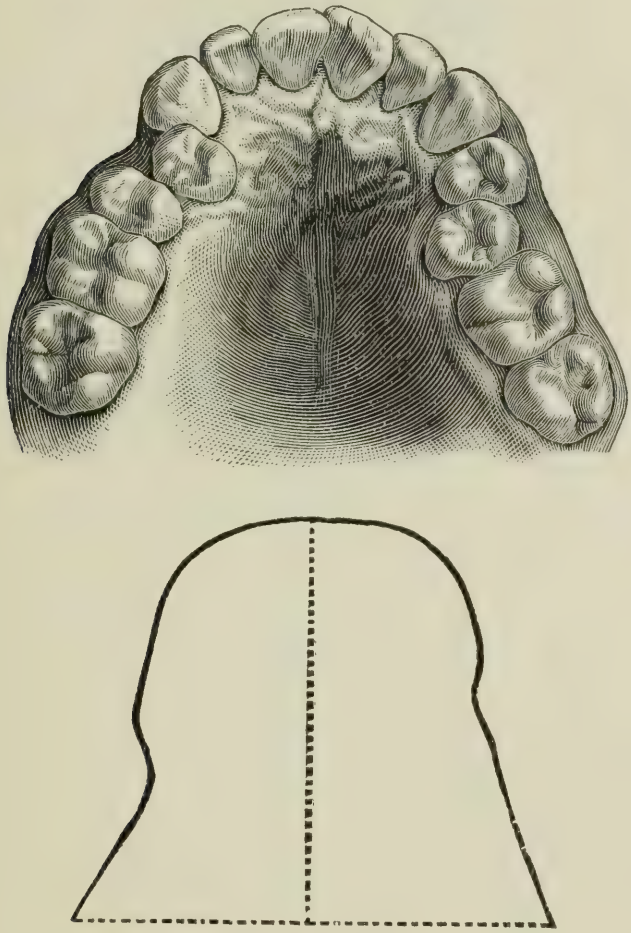
FIG. 57.



quently the second. As has been stated before, this ought not to take place if the greatest diameter of cuspids, bicuspids, and molars were in the same line, but the diameter of one of the bicuspids may be in a line with that of the adjoining tooth while that of the other is not, and then one is pressed along the line of least resistance. As in the case of the V-shaped arch, one side of the mouth may be normal because of the absence of any local condition interfering with the space. One temporary molar may have been extracted, allowing the permanent one to move forward while the other remains in place. The result which follows is an asymmetry of lateral halves termed semi-saddle-shaped irregularity (Fig. 59). How

the V-shaped and saddle-shaped arch on one side only may be produced has already been described. How they may be combined on one side remains to be explained. Given thinness of process in the interior part of the mouth, premature or tardy extraction of the cuspid, and there will be a forward movement of the incisors. The development of the cuspid will press the alveolar process inward,

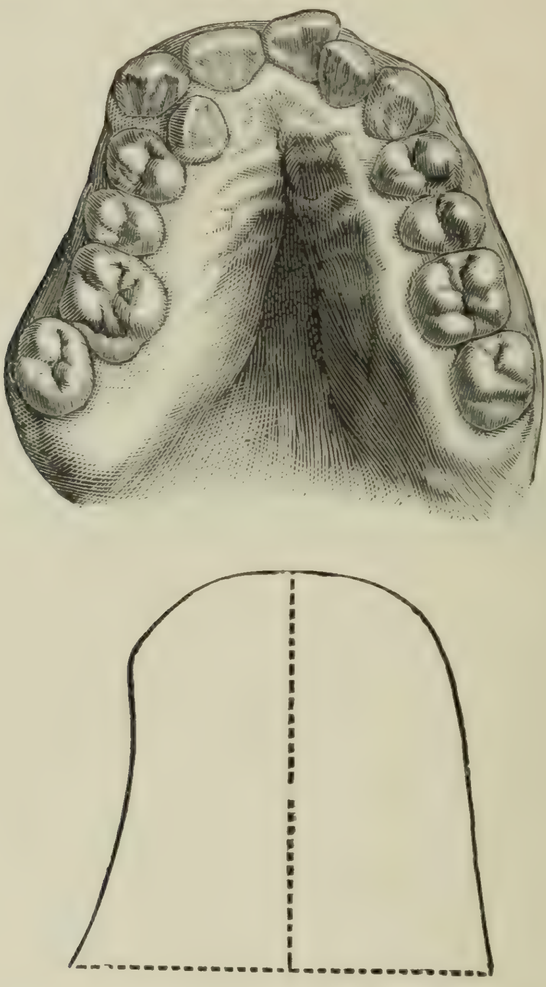
Fig. 58.



thereby contracting the arch, and the tardily erupted bicuspids will adjust themselves to the limited curve, as before stated. In this way the features of the two forms are combined,—that is, a contracted or angular anterior arch and a posterior arch that is more or less concave. The opposite side may be V-shaped, saddle-shaped, or normal (Figs. 60 and 61). Deformities of the dental arch are due first to arrest of development of the jaw, and, secondly, in the nature of the deformity to the order of eruption of teeth which rarely erupt twice alike and is always local or mechanical. From an evolution stand-point these deformities are atavistic. The V-shaped

reverts to the reptilian type, the saddle-shaped to the carnivora. Dr. W. C. Barrett, of Buffalo, has frequently called attention to the shape of the anthropoid arch. In the gorilla, the nearest to man in dentition, there is a very distinct approach to the saddle-shape.

Fig. 59.

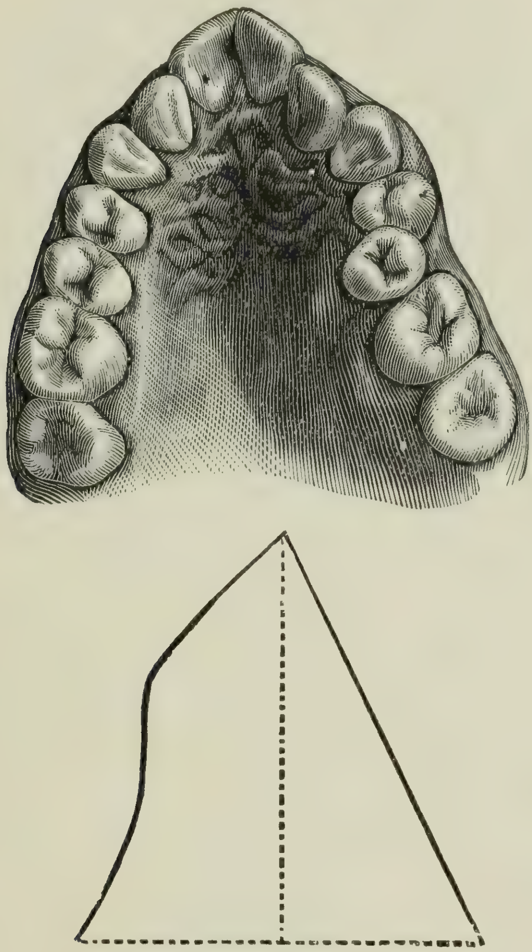


In the chimpanzee it remains. The orang-outang exhibits a less tendency. The arch of some of the cebidæ very nearly approaches man. It all depends upon the extent of prognathism. When that is reduced the arch appears, and rectangular arrangement of the teeth is lost. Most carnivora exhibit a distinct approach to the saddle-shape. Some felines have a shortening of the jaw, partially obliterating the tendency, but in most canidæ it is quite marked. From the stand-point of comparative anatomy, Dr. Barrett is of opinion that the tendency towards the saddle-shaped arch is a reversion to earlier form.

These are facts which cannot be overlooked, since from the very

nature of development and eruption of the teeth they cannot take any other form. The arrangement of the crowns of the cuspid (canine) in the jaw before eruption is such that no matter what the local condition of the jaws or teeth may be, the V- or saddle-shaped dental arch must be produced.

Fig. 60.



In no symptom is degeneracy as evident as in the stigmata resultant on hypertrophy of the alveolar process. This occurs at all ages, but more particularly at the period of development of the permanent set of teeth. The entire alveolar process may become involved (Fig. 62), or only a portion (Fig. 63).

Hypertrophy of the alveolar process is the result of irritation incident upon eruption and the shedding of the temporary teeth and eruption of the permanent teeth.

Laryngologists, rhinologists, and neurologists claim that certain vaults are deformities, when in reality the alveolar process had hypertrophied.

Fig. 61.

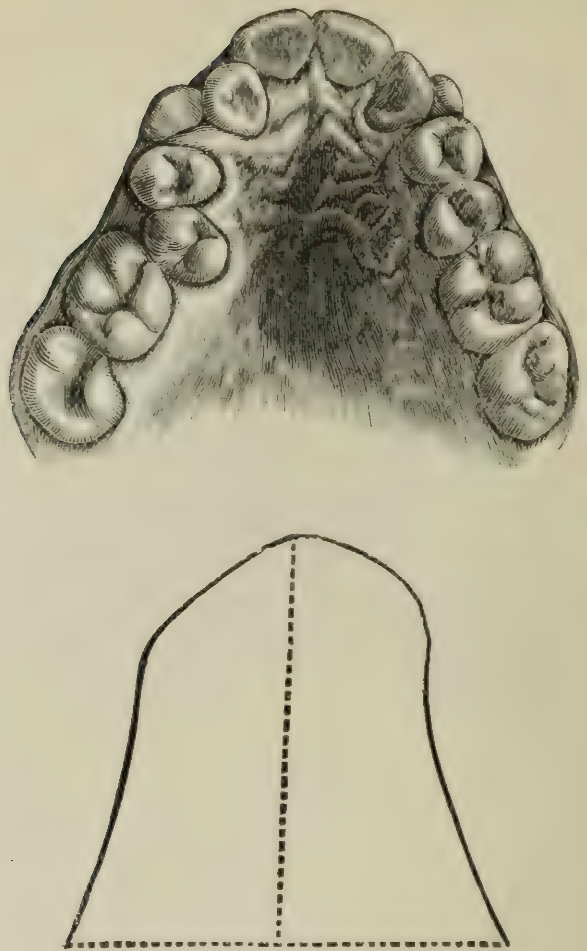
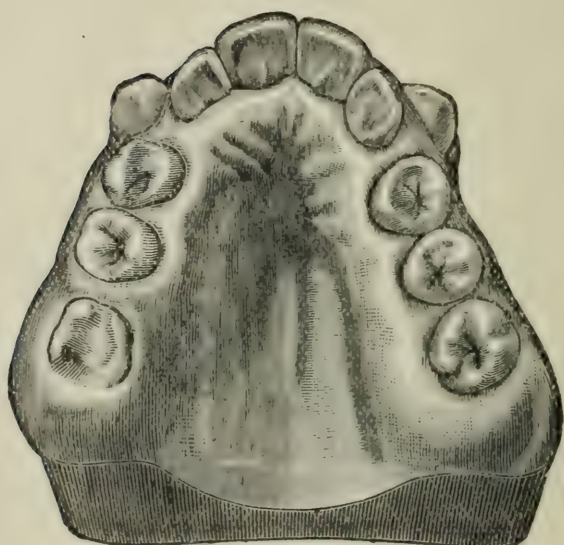
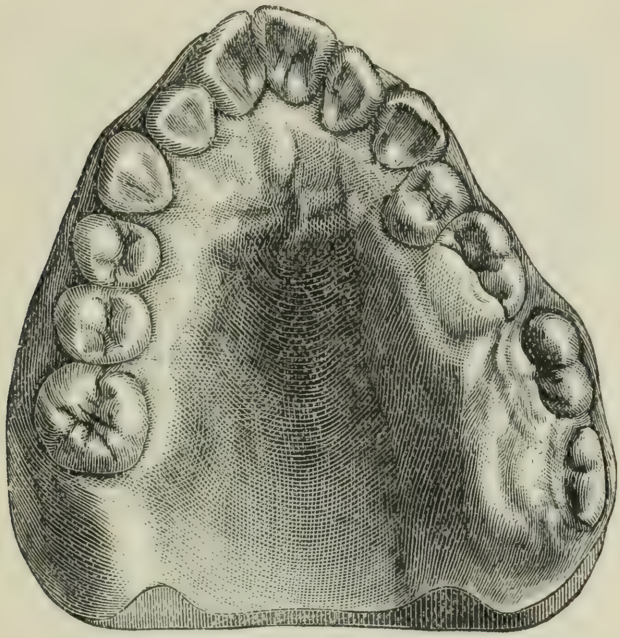


Fig. 62.



The jaws, as a whole, owing to an unstable and unbalanced nervous system, are liable to become excessively developed as well as arrested in development. Excessive development of the superior maxilla is evinced by a fulness of the upper lip. In these cases the

FIG. 63.



upper maxilla is too large for the lower and stands out beyond it. The lower may be quite normal. When there is simply a want of proportion between the two jaws it is due to the diminutive or excessive size of one while the other is normal. The criterion in these cases must be the facial angle. The upper jaw is usually in harmony with the skeleton, while the lower jaw depends for its size largely upon function, its size being the result of accident rather than design.

When the upper jaw is normal or smaller than the lower, the extent of its posterior portion is determined by the occlusion of the first permanent molar, which keeps the alveolar process in permanent relation to each other at this point and allows freedom of development in front. If the occlusion is not normal the upper jaw and alveolar process will develop laterally as well as anteriorly.

The teeth of the anterior columns may either stand vertically or they may be turned in towards the lower incisors. The latter defection is produced by the action of the lips. When the cuspids are in their normal position, the upper incisors form a larger arch than the lower, and this permits of their being turned inward, but when the cuspids have moved so far forward that they are not nor-

mally interlocked with the lower teeth, the incisors are too crowded to permit this. While the jaws are growing smaller the teeth tend to cause reversion to the original form.

Arrest of development of the superior maxilla is always associated with marked depression at the alæ of the nose, producing the appearance of having been hollowed out from a point at the floor of the orbit to the grinding surface of the lower teeth (Fig. 64). This is the most common type of degeneracy among criminals,

Fig. 64.

and has frequently caused the error of assuming excessive development of the lower jaw, which is normal. And the seeming excess is due to arrest of development of the upper jaw. The lower jaw has in the scale of light gradually grown smaller. Even in some apes it is still large. The changes which have resulted in the negro jaw strikingly illustrate this alteration in size. The lower jaw of the early negro in the South was unusually large. The intermixture of white blood has decreased the size of the jaw until, where there is but a slight admixture of negro blood, the jaw is as delicately shaped as that of the whites. Prognathism of both jaws of the negro arises from the fact that as the lower jaw is much larger in proportion than the upper, the force exerted by the lower against the upper carries the alveolar process and teeth in their formative process forward. This gives prominence to both upper and lower jaws, and its existence is easily demonstrated by examination of our large collection of negro skulls. In the evolution of the race

the lower jaw becomes smaller and harmony results in form and size.

Arrest of the lower jaw (Fig. 65) is common among degenerates. This consists of a shortening of the body. Sometimes it is arrested

Fig. 65.

to such an extent that there is apparently no chin. About fifty per cent. of criminals at Elmira, New York, had this deformity.

The following table shows the number of deformities of the jaws and teeth among some of the degenerate classes:

	Jaws.										Teeth.			
	Number examined.	V-shaped.	Partial V.	Semi-V.	Saddle.	Partial Saddle.	Semi-Saddle.	Normal.	Arrested development.	Excessive development.	Irregular.	Tubercles of Teeth. Present.	Tubercles of Teeth. Absent.	Regular.
Criminals at Pontiac, Ill. . .	465	75	71	3	66	63	16	171	. .	. .	123	13	452	342
Criminals at Elmira, N. Y. .	1041	381	49	1	157	26	. .	422	. .	. .	220	26	1015	821
Criminals at Joliet, Ill. . . .	468	13	79	19	59	92	24	163	. .	. .	. .	. .	. .	. .
Prostitutes at Chicago, Bridewell	30	10	17	7	27	10	10	. .	1	. .	. .	. .	. .	. .
Insane at Dunning, Ill. . . .	700	26	47	. .	12	. .	. .	486	. .	. .	. .	. .	. .	. .
Insane at Kankakee, Ill. . .	613	69	107	29	89	105	61	153	. .	. .	. .	. .	. .	. .
Idiots, imbeciles	1977	129	236	. .	207	. .	. .	1095	. .	. .	. .	. .	. .	. .
Deaf and Dumb	1935	169	192	. .	203	. .	. .	901	. .	. .	. .	. .	. .	. .
Blind	207	7	9	. .	11	. .	. .	105	. .	. .	. .	. .	. .	. .
Inebriates*	514	1.5	24.4	0.3	9.3	13.2	7.7	25.4	. .	. .	. .	. .	. .	. .

* Per cent.

By carefully studying the atavistic conditions herein noted, so common among the degenerate classes, the concrescence and differentiation theories, as advanced by Magitot and Cope and Osborn, in the evolution of the teeth of man, are proved to be identical.

In conclusion, it may be mildly stated that if all structures are so affected as to cause harmony in all the parts, advance in evolution is going on, but if such conditions exist as noted above, degeneracy is resulting.[1]

UNION OF THE AMERICAN AND SOUTHERN DENTAL ASSOCIATIONS.

BY THOMAS FILLEBROWN, M.D., D.M.D., BOSTON, MASS.

THE American Dental Association was formed as a more perfect organization to succeed the American Dental Convention, which it soon supplanted.

The Southern Dental Association was organized to supply a need which can now be better met by one large truly national body.

Both Associations have done good work, and each has supplied a want existing in the professional life of this nation.

Both have been practically local societies, though ostensibly national. The Southern has been limited by its name and its practice. The American has continued too much an Eastern institution, and has hardly kept pace with the march of progress. Its methods no longer serve its best interests; and there need be no surprise at the loud call that is heard for a reorganization and the adoption of methods that shall infuse new life into its councils.

The vital question to-day is, how to form and organize a society which shall be truly national, and serve the needs of the dental profession of this country.

The most natural course seems to be a union of the American and Southern Dental Associations in one strong, national society, with a constitution which protects all interests, invites the best

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[1] The illustrations for this article are taken from the following works: The Dental Cosmos, Diseases and Injuries of the Teeth (Morton and Smale), The Osseous Deformities of the Head, Face, Jaws, and Teeth (Talbot), with a number of original cuts.

efforts of all its members, and provides for progress and enlargement in the future.

The profession united in one national association will respect itself more than it can while divided, will be more influential at home, and thus be able to do more to elevate professional character and make the influence of the dental profession in America more potent in all its relations with the world.

The social element is one of the most powerful forces for the progress of humanity, and this will be greatly strengthened by union. Only few men feel able to afford the time, to say nothing of the expense, to attend two series of meetings in one season both serving the same end; hence under the present dual organization many are deprived of the satisfaction and benefit of personal acquaintance. In one association the members from the East, South, and West will come together at regular periods, compare experiences, offer mutual suggestions, and enlarge, deepen, and strengthen their personal relations. All those who were fortunate enough to attend the union meeting of the American and Southern Association in Louisville in 1888 realize how pleasant it is to dwell together in unity.

By union the importance of the State societies will be enhanced; as the meetings of the larger body in each section of the country will be less frequent; the leading men of each State will naturally interest themselves in their home societies and make their proceedings more valuable, and thus be more able auxiliaries to the National Association.

In 1894, at Old Point Comfort, the American Dental Association appointed Thomas Fillebrown, J. Y. Crawford, Louis Jack, B. Holly Smith, and J. N. Crouse a committee to promote the cause of union of the two Associations, and invited the Southern Dental Association to appoint a like committee for the same purpose.

In response to the invitation, the Southern, at its meeting in Atlanta in 1895, chose Drs. L. G. Noel, E. P. Beadles, J. T. Calvert, F. Peabody, and J. R. Knapp a committee to consider the subject with the committee of the American. These committees have sought to obtain a consensus of opinion as to the desirability of union and the essential points of a plan which would prove acceptable to the members of the Associations, which would protect the interests of the minorities, and at the same time provide the best working plan at the present time possible.

At first considerable opposition to the movement was expressed. The opposition seemed based upon the fear that rights would be

denied the minority and also upon affection for the old Associations. As the matter has become better understood opinion has been more and more favorable to the movement. The votes of both Associations, although not decisive, have invariably been favorable to a union.

A plan including the following provisions meets with quite general acceptance.

1. It seems desirable to take a new name, one distinctly national; just what it should be has not yet appeared. The committee invites suggestions from any member interested.

2. Divide the country into divisions, South, East, and West, and meet alternately in each section. This will insure a meeting in each portion of the country every third year.

3. Organize the new Association in sections the same as the American is now, but have the president (or executive committee) appoint chairmen known to be competent and interested to do the work. It is believed this would lead to more effective and better work. Often in the past but few would be present at the organization of the sections, and men neither fitted nor interested would be chosen to official positions.

A return to the old committee plan has been sometimes advocated. This plan has been followed in the Southern, and the results of the past few years have not been especially encouraging for its adoption in a new Association.

The plan of sections above proposed contains the essentials of the committee plan, but it makes it obligatory upon every member to join one of them, and insures an efficient head to organize and lead the work.

5. A more intimate relation with the State societies may be promoted by providing that they become practically branches of the National Association, and also by making it the duty of societies sending delegates to make a report of the year's work of the society to the Association.

6. Provide for membership of permanent delegates and honorary members as the American Association does now.

7. Choose a president at large, or from the section in which the last annual meeting was held.

Choose one vice-president from each section, the vice-presidents to be of equal rank, and not first, second, and third, as is now the case in both Associations.

8. To many it seems desirable to change the date of the meeting to some time in September, so that members will come fresh from

their vacations ready for work, instead of tired out at the end of an exhausting year. The change would also avoid the excessive heat of August.

While the College Faculties Association and the National Board of Dental Examiners have done a great work for the uplifting of the profession, they have thus far been a direct injury to the interests of the National Associations.

The Southern has suffered because so many of her members have necessarily neglected its meetings to attend the meetings of the Faculties and Board of Examiners which have been held at the same time and place as the meetings of the American. The American has suffered severely by the meetings of the Faculties and Board of Examiners overlapping its meetings and absorbing the attentions of otherwise active members.

This can be remedied in one of two ways, either by the Faculties and Examiners meeting at another time than that of the National Association, or by the meetings being held a week earlier at the same place as the National Association. The latter plan is very likely to be tried the present year, and its effects can be then properly estimated. It is quite reasonable to expect the meeting of the Faculties Association to be called as early as the Friday before the time of the meeting of the American and the Southern Associations at Old Point.

If the Board of Examiners shall also meet early, the work of these bodies will be completed, and the members be left free to engage in the work of the National Association. This is certainly one of the most important considerations for the interests of all concerned.

Dr. W. C. Barrett, at the last meeting of the American Association, and Dr. A. H. Thompson, in an article in a late issue of the *Dental Cosmos*, and several other interested members, have expressed the conviction that division associations should be formed to meet annually as parts of the national society. It is undoubtedly a wise and desirable thing to do, and it seems now quite possible to carry out this idea by providing for it somewhat as follows:

1. The members of each division South, East, and West may form one or more branches to meet annually except the year the National Association meets in the same division.

2. Each branch shall manage its own affairs, subject to the constitution and regulations of the parent society, elect its own officers, and pay its own incidental expenses.

3. Each branch to receive delegates from societies within its limits, and they shall have the same standing in the National Association as those joining direct from local societies.

4. The proceedings of the branches to be sent to the National Association for publication in the transactions of the year.

The details of a plan to accomplish this result can be arranged which will not interfere with the customary working of the National Association. This plan will prevent the destruction of the present societies, and thus remove the principal objection that has been raised against union. One branch would be practically the Southern Association, and the Eastern would include a large proportion of the American membership.

The West might reasonably be able to form two branches. The Western branch and the Pacific branch. Eventually the best interests of the profession may be served by making four divisions of the country. At present we shall probably better succeed with three.

This article does not presume to be exhaustive, but is only suggestive.

The discussion of the subject will show us the best way.

The committee has no plan nor desire save to formulate the wishes of the members of the two associations and invite suggestions as to the points mentioned, or any others which it seems desirable to have considered.

THE RESTORATION OF BADLY BROKEN TEETH WITHOUT CROWNING.[1]

BY S. E. DAVENPORT, D.D.S., M.D.S., NEW YORK.

The above title is intended to express the writer's preference for built-up, patched, banded, and riveted natural teeth over the same teeth cut off to or near the gum and crowned.

The dental profession, itself a specialty, is being of late subdivided into specialties, of which the most popular one, "crown- and bridge-work," is by some unscrupulous men practised because of its advertising and money-making qualities, and even in the hands of conscientious men is often ridden as a hobby far beyond its value.

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[1] Read before the Massachusetts Dental Society at Boston, June 3, 1896.

The writer desires to place himself on record as in favor of both crowns and bridges whenever and wherever the conditions of the mouth and remaining teeth (not the patient's pocket) justify their use; but he desires to emphatically condemn the sacrifice of either whole teeth or parts of teeth for the purpose of crowning or bridging where a more conservative plan is available.

It is hoped that this little paper will direct attention to what the writer believes to be a serious fault in the practice of many dentists, due to the great improvement in the methods of crowning and bridging and to the mass of information concerning the same, which is being spread broadcast in the journals.

The impression made upon the mind of the average dentist by all of this is so great that when he is consulted concerning a broken tooth he immediately considers the various methods of crowning, and decides to use one of them, while, if he would give the same amount of thought and ingenuity to the devising of a plan for the preservation of what remains of the tooth and a restoration of the broken portions with some strong material, he would not only give his patient in the majority of cases a more useful organ, but he would not be taking the very last possible step for the preservation of that tooth.

Crowning should be, just as it is, in fact, *the last resort!*

Many instances illustrating the abuse of crowning could be cited from the writer's observation, but he will confine himself to a description of a few general classes of cases.

Occasionally he has removed gold crowns for the purpose of relieving painful conditions, and has found underneath live teeth so good, even after the wholesale grinding to which they had been subjected in the fitting of the crown, that he has been able to restore their contour and usefulness with fillings.

Both gold and porcelain crowns have been seen by the writer in the mouths of patients under fourteen years of age, children of well-to-do parents, the other teeth being of average strength.

Such cases are always from the hands of some practitioner who "makes a specialty" of crowning. Dentists of this stamp do not hesitate to condemn molars and bicuspids having ordinary compound approximal cavities to a hollow gold crown, positive assertion being made to the patient that the tooth is beyond hope of safety from fillings.

Such crowns are usually put on without regard to contour, and as a consequence food crowds in and decay begins at the gum. Of course, when a tooth is once cut off and crowned it is almost im-

possible for other dentists to decide whether crowning was necessary or not, as all direct evidence is usually destroyed. The general condition of the other teeth and the density of the tooth-substance are about the only guides remaining, unless some opinion can be formed from a knowledge of the dentist whose judgment was followed.

One very weak point in crowning is the almost universal use of zinc phosphate for the cementing material. Gutta-percha is so much more reliable and durable as a cement, besides allowing the crown to be removed upon the application of heat whenever necessary, that it seems strange more operators do not use it in preference to the phosphate cements.

Amalgam properly selected, prepared, and packed is, in the large majority of mouths, a very durable material, and it is, of course, the sheet-anchor in the building up of broken teeth, with the possible exception of the incisors, even though porcelain or gold, or a combination of the two, may be used for the purpose of hiding the amalgam from view.

Dr. George S. Allan, of New York, in his recent able paper upon the subject of contouring, justly places amalgam among the "constants" of his equation, and whenever a method of restoration or partial crowning can be adopted which will admit of the use of amalgam in place of the usual zinc phosphate, a great element of strength and durability is certainly added to the finished operation.

While the writer would prefer to leave to every dentist's ingenuity the methods most suitable for the restoration of broken teeth, provided each operator would give his thought to the preservation of what remains, rather than to the cutting away of everything in sight preparatory to crowning, it may not be out of place to briefly describe a few methods which have been of great service to the writer, and may, when modified to suit the special case in hand, be of some help to others.

Before describing any certain methods it will, perhaps, be well to say a few words about some of the mechanical devices common to many operations. Metal pins for use in the roots of pulpless teeth as anchorage posts may be made of platinum alloyed with iridium, gold alloyed with platinum, or of stiff German silver wire, the latter being, of course, much less expensive but not quite as reliable for the demands in all respects as the two first named.

This wire in several different sizes (say Nos. 3 to 7 of bur-gauge) should always be at hand, and before being used a shallow screw-thread should be cut upon it merely for the purpose of giving

proper hold to whatever plastic material may be used in connection with it.

The writer prefers to select a screw a trifle smaller than the calibre of the prepared root-canal, and cement it in place with zinc phosphate, rather than to use a screw slightly larger than the canal, depending upon the thread cut in the dentine by screwing it in, as some operators do. What has been said above against the use of zinc phosphate refers, of course, only to its use in locations reached by the saliva. Stiff German silver is not as rigid as the other wires referred to, but will always answer if two roots can be utilized, a pin being placed in each. It is not affected by mercury, nor is ordinary clasp metal—gold and platinum—by the proportion of mercury in amalgam, though pure mercury will sometimes affect it slightly. Stiff German silver has been referred to because there are two varieties of the metal obtainable. The largest round bur used in preparing the root-canal for the reception of the metal pin should be measured in the bur-gauge, and a pin just one size smaller selected for use.

The next adjunct of importance in many of these operations is the ring matrix of thin steel or German silver, which every dentist should have at hand in all sizes and widths.

They are easily made, a little muriate of zinc and soft solder only being necessary to join the ends, care being taken to place the point of union against tooth-structure when they are to be used with amalgam, so that the solder may not be eaten by the mercury. Thin steel of a variety of thicknesses suitable for the making of such matrices is now obtainable at most dental depots, though at a higher price, as is usually the case, than if the same be purchased of houses in that special line of business. They are useful daily to assist in the shaping of plastic fillings, and can often be made to serve as a help in contouring with gold or gold and tin. Their use is also indicated to encircle teeth having approximal decay extending some distance below the gum, the rubber dam being easily applied after the placing of the matrix.

A box, something like the one now shown with numbered pins for holding and separating the ring matrices according to size, is easily constructed, and with the measuring mandrel completes a most useful adjunct to any office.

Gold-faced platinum, which is pure gold welded upon pure platinum, is so useful in many cases of reconstruction that it should be referred to here with the other standard helps. It is very soft and can easily be made to conform to any surface, and

the platinum side is, of course, valuable when amalgam is to be used.

For ordinary permanent bands of gold-faced platinum, No. 32 is about the right thickness, though when a split molar is to be banded a heavier number would be better, because of the great strain which would come upon it.

One of the most common accidents which dentists are called upon to repair is the superior bicuspid from which either the buccal or palatal face has broken, often to the gum line, carrying away frequently both approximal fillings. Such teeth are usually pulpless, and the remaining portions of the crown can be retained, and the contour restored either with amalgam or with a combination of amalgam and porcelain as follows:

If the buccal wall is still standing, a strong metal pin should be cemented into the root and left nearly as long as the finished palatal portion is designed to be. All soft and frail edges having been cut away, a temporary band matrix, similar to those shown, is selected of a size suitable to represent the proper contour of the finished tooth, and is put in place outside of and around the broken crown and the pin, care being taken to fit the matrix accurately to the gum line above the break.

The ring matrix is then filled carefully and solidly with amalgam, the first pieces quite plastic, to enter all inequalities about the pin and broken tooth, but hard and dry amalgam should be used when the operation nears completion. The ring should be left on the tooth for at least six hours to support the amalgam until fully hard, when it should be removed and the amalgam shaped and polished.

Should the buccal wall instead of the palatine be broken off, a cross pin porcelain facing of the proper size and color should be selected and ground to fit the buccal aspect of the tooth just under the edge of the gum. The pins of the porcelain are now fitted into a narrow scrap of platinum, or gold and platinum, and soldered with eighteen carat solder. This cross-piece of metal is attached to the pins near their ends at a sufficient distance from the facing to allow a screw to pass through the square opening thus made. The screw is then cemented into the root, the porcelain placed in its proper position with its joined pins encircling the screw, and a temporary band matrix of proper size is used to surround the various parts of this combination.

Enumerating these parts from without inward, there are the steel band, the porcelain facing, the screw, the palatal wall of the

natural tooth, and again the steel matrix. Amalgam is then packed into the matrix and all about the pins of the porcelain, the screw which is secured far up in the root, and into the inequalities of the palatal wall of the tooth.

When the matrix is removed the next day and the amalgam finished, the result is most pleasing. This method of repairing pulpless bicuspids from which the buccal wall has broken was ably described by Dr. E. A. Bogue, of New York, in the *Dental Cosmos* about ten years ago.

Should the broken bicuspid have a living pulp the palatal portion could be contoured with amalgam packed into a band matrix, a good anchorage being obtained at the cervical wall, and care being taken not to build the filling out to the shape of a normal cusp.

When the buccal wall of a living bicuspid breaks, the porcelain selected should be backed with a piece of thin gold-faced platinum, the backing being extended to form a permanent band around the palatal wall of the tooth and amalgam being built into the band between the porcelain and the remaining tooth wall.

Should it be a second bicuspid in a man's mouth, a porcelain facing would not always be necessary, in which case a permanent band of gold-faced platinum should be carefully fitted around the remaining wall and the neck of the tooth and filled in solidly with amalgam. This band should be almost as deep as the required length of the tooth.

Where molars break so badly as to prevent the use of any of the above-described methods, the writer prefers often to use an open band of gold-faced platinum fitted carefully to the gum line of the remaining portions of the tooth rather than a finished and more æsthetic gold crown, for the reason that after cementing the screws into the roots and placing the fitted band in position a good view of the interior can be obtained while amalgam is being packed against the broken margins of the tooth and about the screws until the band is full.

Strict contour can be practised in all these methods, care being used in the selection of the ring matrices and in the fitting of the permanent bands, the material of which both are constructed being so thin as to be easily burnished out to even an exaggerated contour before the introduction of the amalgam.

When two or more screws can be anchored well down in molar roots it is perfectly safe, and adds to the good appearance of the finished operation to groove the amalgam at a subsequent sitting and cover it with gold.

Aside from the improved appearance, gold certainly makes a better and safer masticating surface than amalgam almost anywhere, the amalgam being so brittle that small pieces chip off from those margins which receive the greatest force of occlusion, decay resulting.

So hard is amalgam that it does not wear down to keep pace with the surrounding tooth-substance, which fact causes it often to act as a wedge, thus helping to destroy the tooth it was intended to preserve.

Devitalized superior cuspids often break seriously, leaving but a shell which would not of itself hold any sort of filling for a great length of time. It seems to be the general custom to crown such teeth, but should there be enough of the labial enamel remaining to give a fairly good appearance, the writer derives more satisfaction and he believes a stronger result from cementing a screw into the root and restoring the contour with amalgam, zinc phosphate being used against the thin labial enamel to prevent the amalgam from showing through. At the next sitting the amalgam in sight is grooved and covered with gold.

A word should be said in commendation of those conservative operators who have withstood the onward march of incisor crowns of all descriptions, their great manipulative skill and knowledge of the principles of dental architecture enabling them to restore with gold the portions lost by decay, accident, or wear, often preserving pulps alive and postponing for perhaps ten years or more the evil day when a crown may become necessary.

Much pleasure is also taken in referring here to the "gold bandage" devised by Dr. J. F. Adams, of Worcester, a description of which was published in the *Dental Digest* for January, 1896.

It is certainly a most valuable expedient for preventing fracture and decay of frail teeth and for the protection of worn and eroded surfaces.

The idea is susceptible of considerable expansion, and it is probable that all who take advantage of Dr. Adams's originality will find extended and varied uses for the gold bandage.

The writer has presented a few methods of more or less value for which he makes no claim of originality, being something of a coward, and having had a little experience in dental societies where such claims were being discussed; he therefore asks his hearers to adopt freely whatever may seem of value in the methods described, without fear of encroaching upon the proprietary rights of any one.

It is probable that a better collection of methods for restoring broken teeth could be offered by many present, but as the writer has taken upon himself the privilege of urging his hearers to give first thoughts to preservation rather than to destruction and crowning, it seemed necessary, in order to make his position tenable, to offer certain suggestions in the light of personal experience.

While it would be possible to extend the above list and describe in detail many peculiar operations, emergency cases from practice, such as the banding of split molars, the riveting back into position portions of enamel separated from a tooth by accident, etc., the writer has chosen to refer only to such general classes of cases as are frequently met with, feeling sure that if his hearers will adopt the methods described, with such modifications as ingenuity suggests and the special case makes necessary, so many advantages over ordinary crowns will be observed that each operator will of his own volition improve and extend the system until his creed will read "*preserve and reinforce*" rather than as it seems to in these latter days "*destroy and crown!*"

It is to be hoped that all dentists will bear in mind the high character of their calling,—the preservation of teeth!

ANNUAL ADDRESS.[1]

BY THE PRESIDENT, GEORGE A. MAXFIELD, D.D.S., HOLYOKE, MASS.

To the Members of the Massachusetts Dental Society:

Ladies and Gentlemen,—An examination of the programme prepared for this meeting yields a fair exposition of the scope and aims of this Society.

In this, the president's annual address, I desire to present various subjects for your consideration. The past year has been one of progress in dental science. Of the many valuable contributions to dental literature, that of Dr. J. V. Black deserves special mention. He has presented many new and valuable facts in regard to the characteristics of the teeth, also of filling-materials, and much practical good must result from these studies.

The use of cataphoresis for obtunding sensitive dentine, accord-

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[1] Presented at the annual meeting of the Massachusetts Dental Society, June 3, 1896.

ing to the method introduced by Dr. H. W. Gillett, of Newport, is a decided advance. The labor involved and the long series of experiments, the results of which he has freely given to the profession, proves him a man of true professional instincts and places his name on the roll of honor.

DENTAL EDUCATION.

One of the most important subjects demanding our attention at this time is that of dental education. The advance made in the art and science of dentistry requires to-day a broad and liberal education of those entering the profession. Some of the dental colleges have kept pace with this progress and have advanced the necessary qualifications required of the student before allowing him to matriculate. The majority of dental colleges are delinquent in this matter, and only advance their standard as they are driven to it. The most severe criticism of the law of this State, which requires an examination of every candidate for registration, comes from these colleges. The revelations that are occasionally made regarding dental colleges show the need of a reform. On February 24 last there appeared in the New York *Daily Tribune* this revelation regarding the New York College of Dentistry:

"THE DENTAL COLLEGE CHARTER.

"*A New One may be granted by the Board of Regents.*

"If the charter of the New York College of Dentistry is revoked by the Regents of the University of the State of New York, as it probably will be, a new charter will be granted and the college will be continued without any interruption. It is the object of those who applied for a new charter to place the management of the institution in the hands of a board of trustees, and to give the faculty a stated salary for the services which they perform. At present the receipts of the college are divided among the members of the faculty after the running expenses have been paid, and there seems to be no way under the present mode of management to reduce the debt, which is large. In their statement to the regents, the protesting trustees say that a resolution was adopted by the trustees who were managing the affairs, and that under this resolution the profits have been divided each year among the five professors. They say,—

"Under this resolution the profits of the college have been divided each year among the five professors, one-fifth to each. These professors, therefore, receive no fixed salaries, but take all the profits. It appears that no surplus can ever be accumulated by the corporation on the present basis, nor can any sinking fund be established to take care of the existing bonded indebtedness. At the end of the last fiscal year the treasurer's report showed receipts of \$62,297.52. This amount was disbursed as follows: \$45,062.70 for salaries and

wages; $16,876.81 for other expenditures, of which $5050 was for interest on debt, leaving in the treasury a balance of only $358.01."

The laws of the State of New York have taken this particular institution in hand and inaugurated a reform. On March 19 last the Board of Regents amended the charter of this college, and hereafter no person who is a salaried instructor, officer, or employé of the trustees in said institution shall after the issue of this amended charter hold the office of trustee or perform any act as such.

The grievous wrong done the dental profession by such institutions as this New York College of Dentistry has been cannot be comprehended. If rumors are correct, there are many other colleges that are conducted on the same basis and for the same object. Can we expect that the graduates of these institutions will be professional men while their teachers, by greed and avariciousness, debase the nobler aspirations that mark the difference between a trade and a profession? Some of the graduates of this and like institutions are an honor to the dental profession, but the credit belongs not to their Alma Mater, but is the result of the inherent qualities in the individual himself.

The only means by which the dental profession can be placed upon the plane it should occupy are in the hands of the dental colleges. As long as their principal object is to make money, we cannot find that degree of proficiency in their graduates that the times demand. It is time these institutions were placed on a different basis. There should be no more close corporations conducting dental colleges. Every dental college should be compelled to publish annually a financial statement, showing the amount of their receipts and how their money is disbursed, that the profession may know what part of the college income is expended for educational purposes.

The education of the dentist should be on a broad and liberal basis, and dental colleges should be conducted as are other educational institutions. It is said that three thousand dollars would be over rather than under the average salary paid the professors of our great universities, men who devote their whole time to their professorships. Many of these men would command a much higher income from some other profession or from a business, but their love for their work stands first, their income a secondary consideration.

Only such men as are imbued with a love of science should be

appointed to the professorships in dental colleges. Then, and not until then, will the colleges fulfil their whole duty to their students.

The National Association of Dental Faculties is an endeavor in the right direction, but from the very nature of things they cannot cope with this gigantic evil that underlies the system. Only through the concerted action of dental societies will this reform be accomplished.

In regard to entrance examinations there is much need of reform. I quote from the announcement of a college that has been considered as one of the leading dental schools, "The applicant must be conversant with the English language and give satisfactory evidence of having received a good preliminary education." A personal knowledge of some students that have entered this college evidences the fact that the preliminary education required for entrance to the average high school is much too high a standard for those entering this college.

The State of New York has taken up this subject, and has enacted a law which went into effect August 1 last requiring every student before matriculating in a dental college to file a certificate of the regents that he has had a satisfactory preliminary education, which for those matriculating after January 1, 1897, shall be not less than a full high-school course. At graduation, before receiving a diploma and the degree of D.D.S., the student must pass an examination by the Dental Examining Board of the State. The conferring of diplomas is essentially placed in the hands of a board entirely independent of the teaching faculty. Hereafter this ought to assure a thorough course of instruction and a high standard in all students graduating from any dental college in that State.

In the last announcement of the Boston Dental College they reported one hundred and sixty-nine students in attendance, and I am informed by one of their trustees that the total amount expended last year for salaries—professors, demonstrators, janitors, and a nurse at a hospital—was $12,360. The New York College reported three hundred and sixty-three matriculates, fifty-seven of which did not attend lectures, leaving the number of students as three hundred and six. According to their trustees they paid $45,062.70 as salaries. With this comparison of these two institutions comment is unnecessary. I would recommend that this Society formulate an address, embodying the facts here presented, and appoint a committee to present it at the next meeting of the American Dental Association, and demand that they take some

action in an endeavor to establish these needed reforms. The strong opposition that will arise at any attempt to reform these institutions should not deter us from attending to our duty.

DENTAL LEGISLATION.

Dental legislation, or the enactment of laws regulating the practice of dentistry, has been an important factor in the progress and development of dental science. Nine years ago such a law was enacted in this State, and every candid mind will admit that during these years much good has been accomplished. This law possesses many valuable features, and at the time of its enactment was superior to that of other States. A marked effect of this law was the raising the standard of qualifications necessary for graduation by many of the dental colleges. As time passes the weakness of things become apparent, and we now recognize the defects of this law, and that the time has arrived when they should be remedied. Twice the Board of Registration has attempted to have some minor changes made in this law, but they were unsuccessful. That their attempts failed is not to be wondered at. How could they expect the Legislature would pass any amendments to this law when advocated by only five members of the profession,—the profession throughout the State not evincing the slightest interest in the matter?

I desire at this time to point out some of the defects of this law, and advise ways and means by which the necessary changes can be accomplished. First, there is no provision regarding the moral character of the person applying for registration. The law reads, "They shall be examined with reference to their knowledge and skill in dentistry and dental surgery," and if the examination prove satisfactory the board shall issue a certificate. Several years ago an inmate of the State prison (who since, in a neighboring State, was condemned for murder and died in prison) was granted a certificate by the board. For this they were severely criticised; this, also, was made the basis of an attack against the president of the board in an effort to have him removed. According to a strict interpretation of the law, the board could not have done otherwise. About two years ago a dentist, driven from a city in one of the Western States on account of fraudulent practices, came before the board under an assumed name. Acting under the advice of the attorney-general, the board issued him a certificate bearing the assumed name he had given them. At last accounts he was practising in this city of Boston in his own name. Other

cases might be cited, but these are sufficient to show a radical weakness in the law to accomplish its main purpose. A clause specifying that a person applying for examination must be of good moral character would greatly relieve the board, and many unfit persons could not be registered.

There should be an age limit; candidates should be not less than twenty-one years of age.

The fee for examination should be increased, and the number of times a person can be re-examined should be limited to one or two; after that an additional fee should be charged for each examination. As it is now, the fee is only ten dollars, and no limit to the number of times a person can be re-examined. This does not furnish sufficient funds to pay the legitimate expenses of the board.

The option as to whether the examination shall be oral or written should be left for the board to decide. Under the existing law the candidate generally chooses the oral examination, thus obliging the members of the board to sacrifice too much time and labor to properly attend to the examinations.

A clause should be inserted requiring a candidate for examination to present sufficient evidence to the board that, prior to the commencement of his professional studies, he had a preliminary education equivalent to that required of students entering the dental colleges of this State.

Section 9 of the law should be stricken out. It reads, "Nothing in this act shall apply to any practising physician who is a graduate from the medical department of any incorporated college." I would offer the following as a substitute: "This act shall not be construed to prohibit an unlicensed person from performing merely mechanical work upon inert matter in a dental office or laboratory, or the student of a registered dentist from assisting his preceptor in dental operations while in the presence of and under the personal supervision of the instructor, or a duly registered physician from treating diseases of the mouth or performing operations in oral surgery. But nothing in the provisions of this act shall be construed to permit the performance of dental operations by any unregistered person under cover of the name of a registered practitioner." Under the present law it is a misdemeanor to allow a student to do anything whatever in an office except upon inert matter. In fact, a strict interpretation of the law, I fear, would not allow even this, if it was anything pertaining to the practice of dentistry.

Provision should be made for the appointment of a prosecuting officer, similar to that of the pharmacy law. Under present conditions there are constant violations of the law in nearly every city and town in the State. Many dentists are employing unregistered assistants, and others allow students to perform operations without any supervision. There is a general misunderstanding in regard to the dental law. Many believe, as did ex-Governor Long, that it is for the protection of the dentist from competition, confining the practice of dentistry to a privileged few. This important fact should be emphasized and re-emphasized, that the dental law is for the benefit of the whole people, to protect the public from incompetent practitioners.

It is the duty of this Society to see that the dental law is sustained, and to use its influence to bring about the needed amendments. I would recommend that this Society annually appoint a committee on dental legislation. The old saying that "What is every one's business is no one's business" appears to be the present condition. In attempting this work there must be some one to take the lead, and there must be a reserve force that can be called into action in time of need. If this Society will undertake this work in a proper and systematic manner, there can be no doubt of the result.

If this committee should present a bill to the Legislature to amend the present law, it would be their duty to keep track of its progress, to urge an attendance of the members at the legislative committee's hearing, and, when the bill is reported to the Legislature, then every member should be notified and directed how to use his influence with the senator and representatives from his district for the passage of the bill. If at any time adverse dental legislation should be attempted, this committee will bring the whole influence of this Society against such measures.

Two years ago the medical profession secured the passage of a law to regulate the practice of medicine. This law needs amending, to make it of any force or benefit to the people. Thus far the Board of Registration in Medicine has shown a narrow spirit in dealing with those members of the dental profession who desired to register under their law, and usurped powers that properly belong to the courts of law. An attempt will soon be made to amend this law, and in this connection arises an important question, "Where can the line be drawn that separates the practice of dentistry from the practice of medicine?" While we should aid the medical profession in their endeavors to secure the passage of a

good law, yet the spirit already manifested indicates the necessity of taking some measures to protect the interests of the dental practitioner. This will be properly attended to if this Society appoint a committee as suggested.

Last April, by the resignation of a member, a vacancy occurred on the Board of Registration in Dentistry. As a result of the efforts of this Society, through its committee, his Excellency Governor Wolcott appointed Dr. D. M. Clapp, of Boston, to fill the vacancy.

BOARD OF REGISTRATION IN DENTISTRY.

To properly attend to the duties required of each individual member of the Board of Registration in Dentistry demands a sacrifice of much time and labor. This Society should show its appreciation of this work, and I would suggest that at this meeting some action be taken, by resolution or otherwise, as an expression of its desire to co-operate and maintain the board in their efforts to elevate the standard of dentistry in this State.

And now as to the personal affairs of this Society. The reports from the different district societies, as presented to the councillors this morning, I briefly recapitulate here.

Western District.—Twenty-one members; meetings well attended, and everything in flourishing condition. The majority of dentists of Berkshire County are enrolled as members.

Valley District.—Twenty-eight members; fair interest manifested. Specially prepared programmes call out a good attendance.

Central District.—Fourteen members; fair interest maintained; prospects encouraging. There has been no attendance from outside the city of Worcester at any of the meetings.

Southeastern District.—Twelve members. No meetings have been held, and no report has been presented.

Northeastern District.—Nine members; have held no meetings. With the exception of two or three members, there is apparently no interest in this district.

North Metropolitan District.—Forty-one members; fair interest.

South Metropolitan District.—Seventy-eight members; fair interest.

Total membership, two hundred and three.

While these reports may not fulfil our expectations, yet I believe we have much to encourage us; our organization is more complete, and we are better able to take advantage of the opportunities presenting. The work of building up the district societies

must necessarily be slow. If in formulating plans we truly recognize the conditions confronting us, we shall surely succeed.

There is a lamentable lack of professional tone and vigor, and one need hardly look below the surface to be able to trace the cause for this condition back to those money-making institutions that have posed as dental colleges. There is missionary work to be done, and the need most apparent is for a more personal responsibility by the individual members, and a willingness to sacrifice a little time and labor.

I would recommend that the four Eastern District Societies hold union meetings in Boston at least twice a year, taking an afternoon and evening; the programme, consisting of clinics, demonstrations, and papers, and a specially worded invitation, to be sent to all reputable dentists residing in these districts who are not members.

I would recommend the Central District Society to hold at least four meetings during the year, afternoon and evening, and to make special efforts to secure the attendance of those residing out of the city.

Abstracts and Translations.

INVESTIGATIONS OF THE NERVES OF THE PULP BY THE METHYLENE-BLUE METHOD.[1]

BY MICHAEL MORGENSTERN, GERMANY.

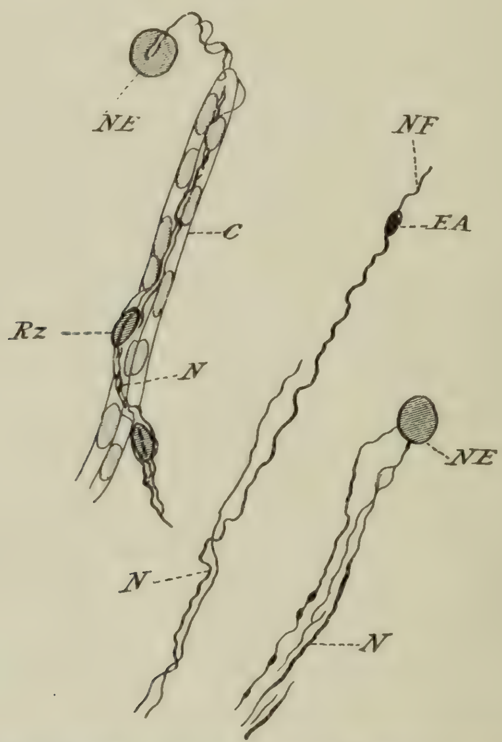
By this method I never succeeded in coloring all the nerves of the pulp blue, and for this reason I used it principally to establish certain special points concerning which the employment of other methods had left me in doubt. Among these were the innervation of the blood-vessels, the relation of the axis-cylinder to various cellular components, the nerve-endings, and the structure of the nerve plexus below and within the odontoblastic zone.

The innervation of the blood-vessels in the pulp is enormous; all the arteries, even the smallest arterioles, exhibited an extremely fine and elaborate plexus. In the larger blood-vessels this plexus shows a very regular arrangement of its fibres, one part of

[1] Abstract from a paper in the Deutsche Monatschrift für Zahnheilkunde, September, 1896.

which runs parallel with the blood-vessels and another at right angles to them; in this way each nucleus is made to rest, as it were, in a net-work of nerves. One or more axis-cylinders are frequently found with the finest capillaries, not uncommonly embracing these in spirals. This was especially easy to establish in the crown pulp of a calf, which sends out a large number of tufted ramifications into the dentine, each tuft in turn consisting of an indefinite num-

Fig. 1.



Nerve-endings from the crest of the crown pulp of a new-born calf, treated by Method 2. Zeiss $\frac{1}{12}$, oil immersion, Oc. ii.—N, nerve-fibres; NE, disk-like terminal bodies of nerves; C, capillary of pulp, by which the nerve N ascends; Rz, Ranvier cells; NF, small terminal nerve-fibre; EA, terminal enlargement of the nerve.

ber of projecting parts; each of these parts contains an acute-angled capillary loop, which projects in the form of a small peg, and about which the dentine cells are arranged very much as the cells are grouped about the blood-vessels of the central or axial part in the dentine germ of young pikes, from which vaso-dentine is formed. Now, among these partly-formed cells there are some in which the capillaries are spirally surrounded by axis-cylinders, while nerve-endings can frequently be recognized between them. The axis-cylinder then separates itself from its capillary, rises generally rather higher than the latter, and then turns in towards the narrow intermediate space mentioned above, where it terminates in a small

ovally rounded body; this often hangs from it like a berry from its stem. (Fig. 1.) As I have also frequently observed that these axis-cylinders terminate similarly at these points in a small elongated body, I believe I must assume that the two bodies are only two

FIG. 2.

Nerves from the pulp of a calf's tooth, colored with methylene blue according to Bethe. Zeiss $\frac{1}{12}$, oil immersion, Oc. ii.—Rz, contractions between Ranvier cells; REF, brush-like ending of a nerve.

different aspects of one and the same formation, which accordingly must have the form of a disk. I note here, parenthetically, that I have found analogous formations in dentine that had been treated by the corrosive sublimate method (Golgi), and had afterwards been colored with hæmotoxylin; but in such cases these disks have more commonly the form of a rhombus with rounded angles.

Most of the nerves show throughout their more or less considerable extent an undulating, spiral, or zigzag course; the larger

fibres have Ranvier cells at fairly regular intervals, the finer ones have few cells or even none at all, although they have many knobby enlargements, which appear in the finest fibres only as points. (Fig. 2.)

It is difficult to determine nerve-endings in the pulp with certainty, because one can never assert with absolute assurance that where a fibre appears to terminate, it does not in reality continue in some other direction that lies outside of our field of observation. Nevertheless, I believe that the great attenuation of many fibres warrants the conclusion that they terminate as free fibres, especially when they divide, like a brush, into a number of very fine threads. (Fig. 2, REF.) It was possible, however, to establish more positively the fact that many axis-cylinders terminate in small, knobby enlargements, beyond which for the most part a very fine, short thread extends. (Fig. 1, NF.)

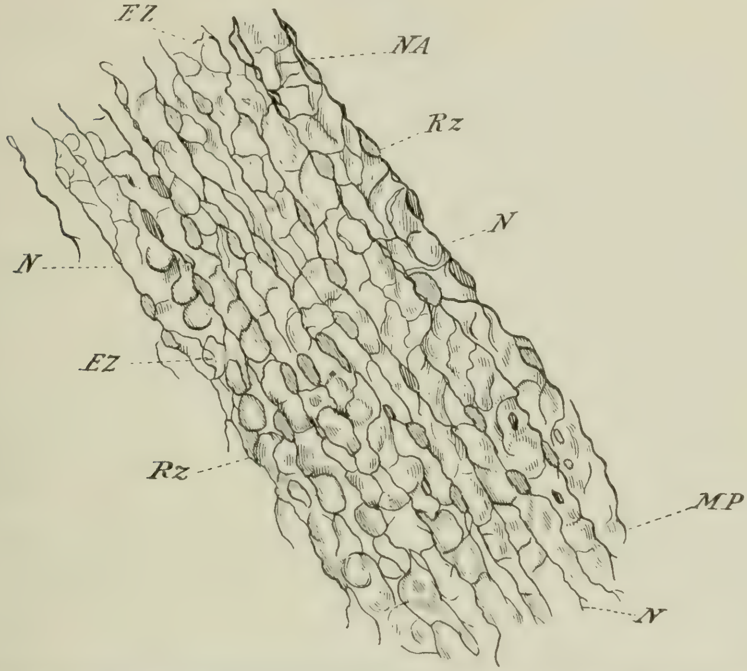
Between and below the odontoblasts the nerves frequently terminated in rounded cellular bodies, which could be better shown by another method, by means of which they are brought into sharper contrast with their surroundings. That these bodies are identical with the terminal disks described above may fairly be assumed.

The most important question, whether the nerves extend throughout the entire odontoblastic zone, could be answered positively by Bethe's modification of the methylene-blue process. By this method nerve-colorings appear only here and there in the inner part of the pulp. At first I was afraid that the seemingly diffuse blue tint of the odontoblastic zone rendered it impossible to recognize nerve-colorings, and for this reason I discarded a whole series of specimens which had been prepared by this method. However, on a very bright day, when I examined this zone under higher magnifying power, and with the use of oil immersion, the diffuse coloring resolved itself into one that was differentiated with considerable sharpness. (Fig. 3.)

In the so-called horns of the pulp—more correctly the crest—nerve-fibrils were universally present between the elementary cells, which were but imperfectly united to form odontoblasts; these nerve-fibrils lie in close parallel lines, and send out a large number of small lateral branches between the elementary cells, which are arranged side by side in rows. The latter are colored light blue, and their cell bodies, which by the absorption of dentinogenous substance are already partially in process of dissolution, are fairly interwoven in the delicate fibres of an intercellular net-work; these fibres show by their marked blue tint, and by the fact that they

spring from the primary nerve-fibres, that they are integral constituents of the nerve system which extends throughout the pulp.

FIG. 3.



Longitudinal section through the odontoblastic zone at the crest of the crown pulp from a new-born calf. Colored with methylene-blue according to Bethe. Zeiss $\frac{1}{12}$, oil immersion, Oc. ii.—MP, calcified zone (the so-called membrana præformativa); EZ, elementary cells which have been changed by transmutation into dentinogenous substance, and which have only united imperfectly to form odontoblasts. N, nerve-fibres; they form parallel lines between the odontoblasts and send out numerous lateral ramifications, NA, between the elementary cells, enclosing these, as it were, in a fibrous net-work; Rz, Ranvier cells.

I had previously treated dentine germs from the human and animal fœtus by the aniline-blue methods of Ciaglinsky and others (Stroebe), and I had noticed that the fibrils of Weil's zone were colored blue, like axis-cylinders, but that the dentinogenous substance was likewise colored blue. I was accordingly unable to demonstrate from these preparations that these fibrils and their branches, which extend between the still disunited elementary cells, were really nerves. Where odontoblasts had been formed there quite often appeared in them, at fairly definite intervals, narrow transverse strips of a blue tint,[1] by which the odontoblasts seemed to be divided into segments. I held these fine blue strips to be dentinogenous substance, which showed itself in this form in the

[1] Entwickelungsgeschichte der Zähne, in Scheff's Handbuch der Zahnheilkunde, 1 Band, Seite 280–281.

odontoblasts. Erwin Hoehl,[1] likewise observed this phenomenon, but correctly explained these transverse strips as fibrils of the intercellular net-work. That this net-work is formed for the most part by elements of the nerve system I was now able to demonstrate conclusively by the methylene-blue and other (Nikiforoff) methods.

In this connection my method with formic acid proved peculiarly efficacious. In the odontoblasts, which are very darkly colored in their medial and central parts, one can still recognize in many places the outlines of what were originally elementary cells; between these dark fibres appear, which continue towards the centre as a fibrillary net-work of Weil's zone, and which, in many portions of the specimen, can be traced to the sharply-colored medullary nerves.

In the odontoblastic zone, on account of the dark color in the specimens, I was only occasionally able to demonstrate transverse strips or fibrils running transversely; but the intercellular net-work of Weil's zone was all the more apparent. I note here, parenthetically, that, according to my more recent investigations, Weil's zone, despite its apparent poverty in cells, nevertheless consists of a dense aggregation of cells that have been transformed by a peculiar chemical change. Some of these cells have remained unaltered, and appear in this zone as isolated nucleated cells, while the rest, having lost their nucleus, are indicated for the most part only by the finer fibres of the intercellular net-work. The fibrous constituents of this net-work developed originally between the former elementary cells (mesodermic cells), enclosing the latter as in a genuine sheath. After the transformation of the cells, during which their contents first become transparent and then granular and clouded, the network is at first more prominent, and impresses one as a separate zone. During the next stage of evolution, in which row after row of the transmuted cells develop dentinogenous substance and unite to form odontoblasts (conjugation of the elementary cells), the intercellular net-work is again invisible, on account of the optic properties of this dentinogenous substance, and does not appear beneath the structural outline of the dentine fibres and their ramifications, until the sections between these have been transformed by the absorption of lime salts into basic substance.

That cells which belong to the nerve system do occur between the odontoblasts is proved both by preparations made by me

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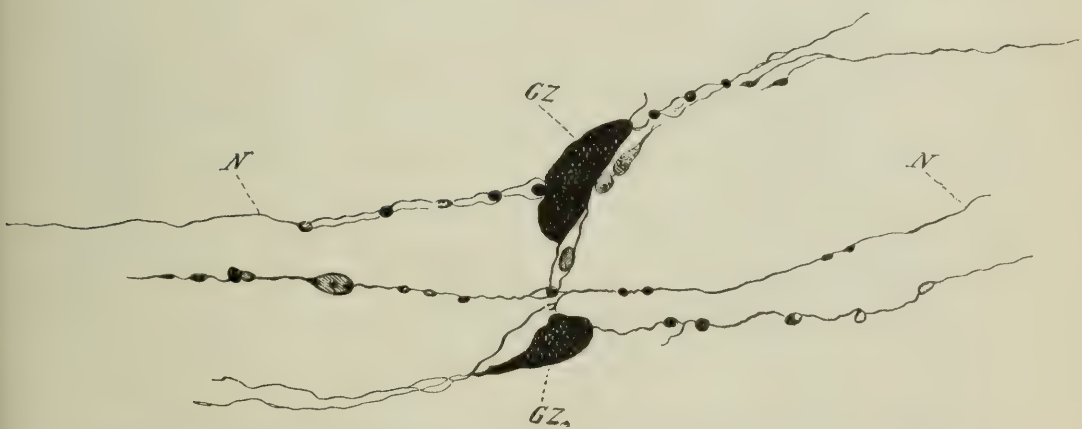
[1] Beitrag zur Histologie der Pulpa und des Dentins, von Erwin Hoehl, Arch. f. Anat. u. Physiol., 1896, Anat. Abtheilung, Seite 38 u. 44.

according to Method 2 and also by those made according to Method 6. These cells are very narrow, on an average from two to four μ broad and from four to seven μ long; they have been overlooked heretofore by others on account of their small size and on account of the difficulty experienced in coloring them. (Fig. 3.) By Bethe's methylene-blue method they are colored a light blue, violet, or greenish-gray blue; by the osmic-acid method, dark brown or dark gray. As has been already stated in the introduction, the peculiar chemical and optical properties of the odontoblastic zone serve to explain why the morphological constituents are so difficult to recognize, both there and in the membrana præformativa. The more nearly the odontoblastic zone approaches the dental process the more thoroughly does it seem to be saturated with a hyaline substance, which opposes an almost insurmountable obstacle to all investigation.

The question whether ganglion cells occur in the pulp of the teeth could be answered by the aid of the methylene-blue method, to the extent that remarkably large cells connected with at least two nerve-fibres occur, especially in the neighborhood of the larger blood-vessels,—*i.e.*, in the axial portion of the pulp. (Fig. 4.) I

FIG. 4.



Nerves from the central part of the pulp of a sheep's tooth, treated by Method 2. Zeiss, objective D, Oc. iv.—N, nerve-fibres; GZ, ganglion cells.

could not determine the internal structure of these cells by this method. The transition of axis-cylinders from one nerve-fibre to another, the respective interchange of the axis-cylinders of different nerves, could be established in many parts of the pulp.

SUMMARY OF RESULTS.

1. The nerves of the pulp can be distinguished, according to their location and distribution, into central and parietal nerves. The

former exhibit more strongly developed stems, divide generally at about half the height of the crown into nerve-bundles, which again resolve themselves just below the odontoblastic zone into parallel lines of primary fibres. They enter the dentine principally by the so-called horns of the pulp,—more correctly the crest,—passing through the odontoblastic zone. The nerve stems of the parietal system are more slender, but much more numerous than those of the central. They spread in two different directions, an axial and a radial. The former have the same direction as the long axis of the tooth, the latter that of the dentine canals.

2. Although likewise belonging to the parietal system, its outermost stratum forms a system in itself. In the form of a thin leaf it passes around the entire dentine germ, its groups of fibres following a course between the membrana præformativa and the peripheral parts of the odontoblasts, or between mesodermic cells.

3. The more strongly developed nerve-fibres of the central system form no proper plexus in the pulp; those of the parietal system form temporarily in young pulps a plexus.

4. The medullary sheaths of the nerves of the pulp are secondary formations, which can only be determined generally and positively in teeth that have been cut. When the nerves are fused in the dentine the medullary border for the most part again disappears.

5. The odontoblastic zone is traversed in the most varied directions by nerve-fibres; these were already present as intercellular fibrils between the (mesodermic) cells of the dentine germ from which the odontoblasts are formed.

6. Many nerve-fibres have free terminations in the pulp, others show knobby enlargements, beyond which for the most part a short supplementary fibre extends; others again terminate in peculiar cell-like bodies with the form of disks; the latter occur frequently in the odontoblastic zone.

7. In the central part of the pulp large cells appear, which, by reason of their anatomical situation, must be considered as ganglion cells.

Reports of Society Meetings.

THE NEW YORK INSTITUTE OF STOMATOLOGY.

A REGULAR meeting of the Institute was held on Tuesday evening, January 5, 1897, at the office of Dr. George S. Allan, 51 West Thirty-seventh Street.

The President, Dr. George S. Allan, in the chair.

The minutes of the previous meeting were read and approved.

Dr. W. St. George Elliott.—I would like to exhibit a model which is going abroad this week, to be presented to the Odontological Society of London. It is a model of a case that I reported to this society several months ago, a young boy who was a patient in the Children's Hospital here, having a double ankylosis of the lower jaw. The case was operated on by Dr. Poor, of this city. I was present during the operation, in which the ramus was entirely detached on either side, making false joints. As can readily be imagined, I had great difficulty in taking an impression. I finally introduced a piece of shingle upon which was some impression material, and with this I succeeded in getting an impression. Kindly notice the remarkable shape of the jaws and the imperfect development of the lower jaw. The case has gone on successfully, and the young man has now very good use of his jaws.

The President.—Gentlemen, I take great pleasure in introducing to the members of the society and their guests our brother from Cambridge, Massachusetts, Dr. R. R. Andrews, who will now present us with a "Contribution to the Study of the Development of Enamel."

(For Dr. Andrews's paper, see page 205.)

The President.—This being a question of pure science, not necessarily being confined to dentists, your Executive Committee has invited Professor Wortman to open the discussion. Professor Wortman, although not compelled to earn his living by working upon the teeth, has devoted, perhaps, as much time and thought to the general subject of dental anatomy as any man in this country. He has studied the papers of Dr. Williams, as well as those of Dr. Andrews, and he is in a position to intelligently discuss the questions that have come up this evening.

Dr. Wortman.—Mr. President and gentlemen, I have listened with a great deal of interest to Dr. Andrews's paper and his demonstrations, and have also read with care the series of papers published in the *Dental Cosmos* by Dr. Williams. I regret to say that my personal experience of the points in controversy have not been sufficiently extensive to warrant me in speaking upon them with very much authority; at the same time there are some points that I may perhaps discuss.

Before taking up some of these points, it might be well for me to call attention to some of the great generalizations that have been made in the study of this subject, especially with reference to teeth as a whole. I will mention these generalizations, not in the order in which they have been made, but in the order of their importance.

That of the greatest importance, perhaps, was made by Professor Hertwig, in which he gave us a complete demonstration of a fact that a tooth originally pertains to the skin, that it is a dermal appendage, and that its connection with the jaw or with other parts of the skeleton of the mouth is merely a secondary affair.

The generalization next in importance was that made by Professor Huxley, in which he demonstrated the sources from which the different tissues of a tooth are derived. He it was who first gave us a clear and comprehensive understanding of the enamel organ in its relation to the production of enamel. He proved that its source is from epithelial or epidermal structures. He likewise demonstrated that the dentine organ is derived from the deeper-lying embryonic tissues of the jaw.

The next great generalization in the histology of the teeth was that of Tomes, in which he proved that enamel or an enamel organ is in some stage characteristic of all teeth. He established the fact beyond dispute that in all of those cases where the enamel is completely absent in the adult tooth, in its early stages of development, a rudimental enamel organ is present.

Coming now to the question of the structure of adult teeth, I will mention the great generalization made by Cope, in which he has demonstrated the fact from palæontological evidence that all complex tooth-structure has had its beginning in, and has been derived from, a simpler form, in many instances tracing it back to the stage of the simple cone. Although this idea is not fully accepted by all anatomists at the present time, yet it is such a strong hypothesis that it amounts to an almost complete demonstration.

Within the past five years we have had some remarkable addi-

tions to our knowledge of the embryology and succession of the teeth, made by certain German and English investigators. Among these I may mention Kükenthal, Röse, Leche, Tacker, Woodward, and others. These investigations go to prove that in all mammalia, instead of there being two sets of teeth, as we had heretofore commonly believed, there are really four, although two of them persist as mere vestiges. In the human mouth Röse claims to have found representatives of four sets of teeth in the early stages of development.

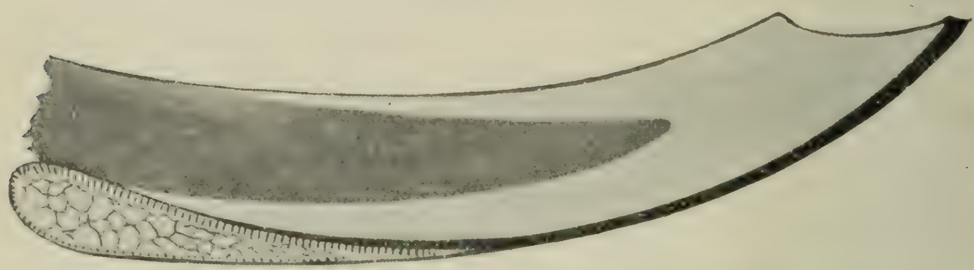
It has been often stated that there are cases in which a complete third succession is developed. If this be true, the explanation would not be difficult according to this view, for it would simply mean that one set of these vestigial teeth has been developed and calcified as ordinarily occurs with the permanent and milk set, with which we are already familiar. There are a number of other discoveries that have been made by these investigators along similar lines, but it must suffice in this brief review to mention this one great generalization.

It may not be out of place, in this connection, to call attention to a discovery that I have recently had the good fortune to make; and while it cannot be looked upon as a broad generalization in regard to the teeth, yet it is of considerable import from the stand-point of the morphologist. All present are probably more or less acquainted with that great group of mammals known as the "edentata." That character which distinguishes them most conspicuously is the entire absence of enamel upon any of the teeth. No clue to their ancestry has hitherto been discovered, and, if we can accept Tomes's law, they must have descended from ancestors with enamel-covered teeth. Indeed, Tomes found a vestigial enamel organ present in the early stages of development, and I can now demonstrate that their early ancestors had a fully developed enamel covering upon the teeth, quite like the ordinary mammal.

A few years ago it was believed and held to be a fact by nearly all dental anatomists that both the enamel and the dentine were formed by the progressive calcification of the dentine and the enamel organs. For my part, I regarded it as settled until Dr. Andrews established the fact beyond question, in regard to the enamel, that it is from materials secreted by the ameloblasts that the calcified product is formed. This discovery resulted in the complete overthrow of the old idea that the enamel cells themselves are calcified.

There are a number of matters of interest in Dr. Williams's papers, and, so far as I am able to judge, the fact of the greatest importance that he has shown is that to which Dr. Andrews has already called your attention,—viz, the nature of the stellate reticulum.

As regards these points in controversy between Dr. Williams and Dr. Andrews, I will address myself to only one or two. Let me first call attention to the question of the development of the enamel organ. Dr. Williams holds to the view, as I understand it, that blood-vessels are developed in this situation. This is a contradiction of all the teaching of histology up to the present time. He cites a number of sections taken from the enamel of the incisor of a rat to demonstrate his point. I have prepared and now exhibit a diagram of the longitudinal section of a persistently growing incisor of a rodent. In this diagram I wish to call



attention especially to the position of the enamel organ, because in the formation of the enamel in a tooth of this kind, every stage is represented from the most embryonic condition to the completely formed tissue. It is a matter of great consequence, as I will attempt to show later, at what point the section is made, if we wish to understand clearly this question of development of blood-vessels in the stratum intermedium of the enamel organ.

But first let us ask ourselves, What is the enamel organ? If I were to attempt to define it, I would say that it is composed of those structures only which are derived from the original pouch or bud of epithelium which arises from the primitive fold. It is true that it may come to be altered later in the course of its development by the incorporation of other elements; but that by no means proves that blood-vessels are developed in this purely epithelial structure, as Dr. Williams would have us believe.

As long as the stellate reticulum is intact the ameloblasts are widely separated from the surrounding connective tissue; but as development proceeds the stellate reticulum disappears and the

ameloblasts and stratum intermedium are brought in close contact with the connective tissue in which blood-vessels abound.

Now, as a matter of experience, I have found it difficult in this stage of enamel-formation to distinguish the boundary of the original enamel organ, and I suspect that the sections of the rodent incisor which Dr. Williams cites to establish his point are of this nature, and that the blood-vessels he finds have had their origin in the connective tissues.

We can probably also judge from this of the office of the stellate reticulum. It probably performs the functions of furnishing to the ameloblasts the necessary material for inaugurating the first steps in the formation of enamel, and its early disappearance would argue that its functions relate solely to the early embryonic stages.

I will invite attention next to the question of the proliferation or multiplication of the ameloblasts. In such a tooth as a persistently growing incisor of a rodent provision must be made for almost unlimited growth, seeing that the length of the tooth is many times greater during the course of the animal's life than it could possibly have been in the embryo. These appearances of bodies in connection with the nucleus described by Dr. Williams, and believed by him to be concerned in the production of enamel rods, I am inclined to think with Dr. Andrews represent but the process of cell multiplication.

Regarding the other points that have been raised in this discussion, I do not feel myself qualified to speak.

The President.—I now take pleasure in introducing our good friend Professor Peirce, of Philadelphia. I urged Professor Peirce very strongly to come to our meeting, knowing his great interest in these subjects, and he kindly consented.

Dr. C. N. Peirce.—I feel that the paper that has been read by Dr. Andrews, and the remarks of Dr. Wortman, have pretty well exhausted the subject, so far as any expressions that I might make in regard to the development of the tissue; but you will pardon a little inquiry in regard to one or two statements which seem to require some explanation.

As Dr. Wortman has said, in speaking of generalizations of the teeth, we have certain animals, such as the toad and dog-fish, where the teeth are simply specialized dermal appendages, and but little more than that; so, in the development of all teeth, we may call them specialized dermal cells, modified by location and function.

But the statement that struck me most forcibly to-night was that of Dr. Andrews regarding the formed enamel, which as soon as completed became non-living tissue,—that is, a deposition of lime in these columnar or specialized cells makes them non-living. I can hardly understand this statement, and am inclined to regard it a misnomer, because changes take place in the enamel all through early adult life, changes which are modifying it in color, density, and sensibility. Therefore, I should feel that the doctor hardly expressed what he meant when he spoke of the enamel as a non-living tissue. Dr. Alfred Gysi, of Switzerland, is making some very extended examinations in this direction, and some photographs which he sent this summer to Philadelphia show some protoplasmic masses. I should judge they were extending from the dentine up into the formed enamel. He contended that these masses were instrumental in carrying nourishment, or plasma containing lime salts, from the pulp in the dentine to the enamel. If this is the case, and I have no doubt of it, we have the tooth, after eruption, supplied and solidified until its induration is completed. I think every dentist recognizes the fact that as a patient advances in years the enamel grows more dense and more brittle, and contains less organic matter. That is certainly the experience of many with whom I have spoken. Another evidence of the vitality of the enamel is the fact that in persons of eighteen or twenty years of age we often see spots in the enamel, white or grayish in color, which in after years become yellow. I have always inferred that, as the plasma is the medium by which lime is carried from the blood into all these tissues, these were imperfectly calcified spots which subsequently become solidified, and in their solidification they became changed in color from white to yellow, because the secondary deposit was of that color. I think every observing dentist must recognize the fact that there is more or less change in the density and color of the enamel of the teeth as the individual advances in years. I have always looked upon the stratum intermedium as being but a progressive stage of development; that it is simply a modification of the stellate cells previous to their appropriation of the material to form the enamel. I have looked upon them, as Dr. Williams has said, as possessing the same function for enamel as the odontoblasts for dentine,—that is, a certain progressive stage of development instrumental in dentine-formation.

Another thing that I think has been clearly shown is the fallacy of the statement that the enamel rods are uniformly of hexagonal

shape. We find them in all shapes,—six- as well as eight-sided. We must have such shapes as will fill in the spaces so that the tissue will be solid, because the enamel is the most dense structure in the animal economy.

Dr. Andrews.—Dr. Black is an investigator in this line. Has he noticed any great difference in the density of enamel of young and adult teeth?

Dr. Peirce.—Dr. Black has not noticed the difference that evidently exists and that should be recognized, nor does he see clearly regarding dentine, for he states that the density of the dentine is not materially increased. In this statement he entirely ignores the filling up of the tubules. Brittleness is certainly an indication of a less proportion of organic matter in the tissues. The books give three per cent. of organic matter in newly formed enamel, and twenty-eight per cent. in dentine. This as a person advances in years diminishes, though the percentage is necessarily small, and Dr. Black, with all his acuteness in investigation, may not be able to measure the change.

The President.—There was one point in this paper of Dr. Andrews which is of a purely histological character, and we have asked Dr. Graf, who is familiar with that line of research, to take part in the discussion.

Dr. Graf.—Mr. President and Gentlemen, it is a very hard matter for me to speak before this society, as I am entirely ignorant of dental anatomy, and I can therefore only discuss some points in the admirable paper of Dr. Andrews from a general cytological stand-point.

The first question raised is that of blood-vessels growing into an epithelial layer. The only similar case mentioned in biological literature was published by Ray Lankester, who believed to have found intraepithelial capillaries in the integument of the leeches. I have reason to believe that these capillaries are not situated between the epithelial cells, but directly underneath them in the connective tissue. The present case of capillaries in the stratum intermedium would therefore appear as a unique occurrence.

With regard to the origin of the calco-spherites, I should like to support the opinion of Dr. Andrews most emphatically that cell division or mitosis cannot have the slightest connection with this secretion.

Mitosis, or as we call it also karyokinesis, comprises a series of complicated processes which all tend towards dividing quantita-

tively and qualitatively the contents of the cell into two halves exactly alike.

The different phases of karyokinesis have been very clearly described by Dr. Andrews, and it is unnecessary to repeat his statement. One little point has since 1895 been worked out more carefully,—namely, the importance of the centrosome in cell division. This body seems to be a permanent specific organ of the cell, or we might call it a kynetic centre of the cell, and there are great doubts as to its nuclear origin during the prophase of division. It seems to be an independent formation.

During cell-division all the individual energies of the cell elements are set free and work in one direction, all tending towards mechanical distribution of the life elements or idiosomes in groups or systems of identical character. During this process we cannot suppose that secretion or other minor functions could go on as usual in the cell besides the cardinal function of mitosis.

I do not hesitate to say that mitosis, if such has ever been observed in the ameloblasts, which is exceedingly doubtful, cannot have the slightest connection with the secretion of calcareous matter from the cell.

It is, on the other hand, not improbable that the resting nucleus of the ameloblasts may have a great influence upon said secretion. It is well proved that the nucleus presides over the metabolic phenomena of the cells, whereas the cytoplasma is mostly the bearer of respiration and locomotion. Secretion and excretion are metabolic processes, and must be directly influenced by the nuclear substances. It is hard to say at the present time whether the excreted substances are formed within the nucleus or not, so much is sure that true chromatin is never used up in the formation of a secreted substance.

We find besides the chromatin another body in the nucleus,—the nucleolus. By a new method I have been able to show recently that the nucleolus consists in all the cases of a different substance than chromatin, which was proved by a sharply contrasting staining reaction of the two substances after a certain treatment.

I have found in cells, which I called reserve food-cells, that the nucleus undergoes great changes during the formation of the reserve food-granules. The chromatin granules melt together until the whole chromatin forms a homogeneous mass, whereas the nucleolus breaks up in a great number of minute granules which are dispersed throughout the whole cell. The cytoplasm of the cell is entirely used up in the formation of round, yellow globules,

and it seemed to me as if the remains of the nucleoli were similarly used up in the formation of these food-globules.

I think we may have a similar case in the ameloblasts. By the aid of the cells of the stratum intermedium the lime salts may be brought in a structureless state into the ameloblasts, in which they are by the direct influence of the nuclear substances chemically transformed, and by subtile mechanical processes secreted in the form of globules,—calco-spherites.

Such cases are very commonly met with in secreting cells. There is another point which has not been quite clear to me,—namely, the net-work of fibres between which the calco-spherites are deposited. As far as I understood Dr. Andrews, he believes they are composed of protoplasma.

Dr. Andrews.—Formed from differentiated protoplasm.

Dr. Graf.—Dr. Andrews means they are exudates of protoplasm from the cells which become metamorphosed into some lifeless matter, something like a reticular formation, as in connective tissue.

Dr. Andrews.—It is the intercellular substance, formerly protoplasm, that is differentiated into fibres.

Dr. Graf.—Connective-tissue fibres may be understood to be transformed protoplasm, just as the contractile muscle fibrils are a metamorposed protoplasm.

Dr. Andrews.—Yes, as I understand it.

Dr. Graf.—If the connective-tissue fibres are metamorphosed protoplasm, then we have two kinds of fibres in the connective tissue,—extracellular fibres, which in this case would represent processes of the cells which have become transformed into a lifeless matter, and intracellular protoplasmic fibres, the regular cytoplasmic thread-work. These cytoplasmic threads form the ground substance of protoplasm, and the spaces between them are filled by a fluid, the cytolymph.

The cytoplasmic fibres may form an irregular net-work, or they may centre towards a central body, as in the astral figure, during mitosis, or they may even run parallel through the whole cell, as is the case in many secreting cells.

Such fibrous structures are also the ciliæ which protrude outside of the cell; but my view is that the ciliæ are lifeless, cuticular formations, and only in their basal pieces we have to see the moving, living part. I hold also that the extracellular fibres, as in the connective tissue and in Dr. Andrews's case, are cuticular formations, and not protoplasma.

Dr. Andrews.—I have been led to believe that they are formed from differentiated protoplasm, that they are lifeless, and become fully calcified.

Dr. Graf.—There is not the least doubt but that the fibres in question are lifeless, the only undecided point is whether they are lifeless from the beginning,—namely, that they are simply secreted by the protoplasm, or whether they were a first living exudate of protoplasm which became gradually transformed and calcified, and thus lifeless. This question is to my mind wholly undecided, and it is to be hoped that by new methods of investigation this point also might be elucidated.

The vice-president, Dr. E. A. Bogue takes the chair.

Dr. George S. Allan.—The two series of papers of Dr. Andrews and Dr. Williams cover the subject of the enamel and its development in a most beautiful and complete manner. I feel sure that if these two gentlemen, Dr. Andrews and Dr. Williams, could have studied this subject together, talking it over as they worked, there would not have been any great differences of opinion as to the points discussed to-night. They agree very closely in many matters, and I am convinced that their differences would have mostly disappeared had they been able to compare notes as they went along in their investigations.

Dr. Williams in his antagonism or dislike to the views of Professors Heitzmann, Abbot, and Bödecker is very positive in the expressions he makes use of; but I confess, for one, that I think Dr. Williams was justified to a great extent, for a more unwarranted endorsement of a book than that given by the National College of Dental Faculties to Dr. Bödecker's work I cannot conceive of, and that is Dr. Williams's excuse for his repeated references to Dr. Heitzmann's exploded reticulum theory. The investigations of the leading biologists and microscopists have shown that there is nothing in the theory of the least value. Dr. Andrews quietly ignores the subject of Professor Heitzmann's theory, and possibly that was the better way of expressing his own views.

The differences between Dr. Andrews and Dr. Williams seem to be largely in regard to the ameloblastic layer. Dr. Williams speaks of the ameloblastic membrane, and the thought comes up, if these are membranes what office do they perform? If the stratum intermedium secretes, through its cells possibly, some gelatinous fluid, how does that fluid pass through this membrane? It would be impossible, under the known laws of physics, for that fluid to pass through except on some principle of osmosis, and that would

conflict strongly with Dr. Williams's conception of the duty of the stratum intermedium. The same difficulty confronts us when we consider the inner layer, or the inner membrane; that is, the membrane lying between the enamel cells and the forming enamel. Granting that that is a membrane, how can the forming material, which is secreted by the ameloblasts, pass through that membrane in any formed condition? It must act like a sieve, even if it be an open, fibrous structure; and if it is not an open, fibrous structure, and the fluid passes through by some principle of osmosis, then that completely destroys any possibility of the existence of a network of formed material that could construct a skeleton on which this beautiful structure is built. It is quite possible that the nucleus is in a large measure interested, if not directly certainly indirectly, in the production of the plasma that is to form the enamel prisms; but the theory of mitosis, as Dr. Andrews plainly shows, can have nothing to do with it. The nucleus most certainly is largely interested in the process of synthetic metabolism, more so than the cytoplasm of the cell, as recent investigations and discoveries plainly indicate, and so it would appear that Dr. Williams was not as careful as he ought to have been in seeking an explanation (foundation) for his views. Dr. Williams, I think, will acknowledge this when he reviews his work, and so no more need be said in reference to it.

While these photomicrographs of Dr. Williams, with some others that I have had presented to me by Dr. Mummery, of London, are the nearest to perfection of any that I have seen, I want to say most positively that the photomicrographs with which Dr. Williams illustrates his articles in the *Dental Cosmos* fall very far short of what he claims for them. I have looked them over very carefully, especially those of the formed enamel, and those which he claims show this fibrous matrix or skeleton net-work on which the enamel is said to be built, and either my eyes are very imperfect or the pictures do not show the net-work. I do not say that this beautiful structure does not exist, but so far as the photomicrographs are concerned they do not show it. Following his own line of study and his own illustrations, and what he has to say of them, I feel that it is doubtful whether there is any such beautiful structure. In a great many matters of this kind it is a question of interpretation. Dr. Williams may interpret a preparation one way and Dr. Andrews interpret it in another way; and in regard to this alleged skeleton net-work, I would protest against receiving it with full measure of authority.

One of my preparations of developing enamel shows the rods cut transversely and circular in form. They become hexagonal only when they lie close to one another, and compression has changed their shape. It is difficult to conceive how, at least in this preparation, a fibrous matrix could be developed. In the cut ends of the rods may be seen a dotted appearance as if some threads morphologically different from the rest of the prism were running through them. My study of this preparation and others inclines me to the belief that at this stage of development the rod is round, and no interprismatic threads can exist.

Before closing I want to show a series of photomicrographs which Dr. Mummery sent me a few years ago. They are equal to those of Professor Williams, and it is a pleasure for me to take this opportunity to show them in public, and at the same time to extend my thanks to Professor Mummery, which I have not had the opportunity of doing before in this public manner. Now these photomicrographs, which, as will be seen, are exceedingly beautiful, fall very far short of what may be viewed under a good compound microscope when the same tissues are examined, as any one having the slightest acquaintance with the use of the microscope will acknowledge.

My studies of the dental tissues have been mostly made with a P. & L. water immersion lens ($\frac{1}{6}''$), a most excellent glass, an apochromatic ($\frac{1}{12}''$) of same making, and a P. & L. achromatic condenser. I have never seen the superior to the last glass in clearness of definition.

Dr. Watkins.—Professor Wortman made the statement that there were in the human jaw the germs of four different sets of teeth, and that it was not an unusual thing for dentists to see the third set appear. I would like to ask Professor Wortman, or any other gentleman present, whether he has been led to believe that he has seen a third set of human teeth.

Dr. Wortman.—I have never seen a third set of human teeth, but we have the authority of Röse and others that there are four sets of germs present in the jaw in the early stage of embryonic growth. I depend upon their statements; and while I have never seen them myself, I am willing to accept their observations. I know that the statement has been frequently made, but I could not tell of any one who has ever seen a third set of teeth developed. I have heard it stated, and I believe it is held by some dentists, that a third set of teeth is not an impossibility.

Dr. Andrews.—I had a patient who had four molars on one side, and a more perfect set of all the teeth I never saw.

Dr. Watkins.—I have seen what appeared to be four lateral incisors in the upper jaw, and all apparently perfect. That is the nearest I have ever got to the third set of teeth.

The President.—We will now ask Dr. Andrews to say what he desires in closing.

Dr. Andrews.—Mr. President, I have little more to say. In the discussion the various points have been well covered. In regard to what Professor Peirce has said about the persistency of the organic matter in the enamel, I may call his attention to Dr. Black's recent investigations. He has found that there is very little difference between enamel of soft and enamel of hard structure. His experiments proving this were made with the finest modern appliances, and were thoroughly scientific.

Charles S. Tomes, of London, after recent analysis, endorses this. He says enamel is practically an inorganic tissue, there is not enough organic matter in it for quantitative estimation. He gives us clearly to understand that that which has generally been figured as organic matter is really water in combination with calcic matter. This statement of Mr. Tomes was made before the Odontological Society of London in 1896.

There are undoubtedly some points concerning the formation of enamel that we do not clearly understand, at least I do not. We find organic bodies running into the substance of the enamel from the dentine, but this is not an enamel substance, it comes from the dentine before the parts calcified. It is a subject that needs further investigation. I believe with Professor W. X. Sudduth, that the enamel is merely a coat of mail to protect the dentine, and with Tomes, Black, and Williams, that enamel is practically an inorganic substance.

The question asked by Dr. Allan, as to the chemical nature of these globular bodies, would require a great amount of work to answer intelligently, work of a somewhat different kind from that which I have been doing. It would require the services of the histo-chemist. When the chemistry and histology of the tissues are studied together, we shall arrive at more exact conclusions. I have not the ability or the time to go into such a series of investigations. I do not recall any other point I wish to speak about.

Dr. Charles F. Allan.—Mr. President, the paper we have just listened to by Professor Andrews is a very valuable one, and it has also been interesting almost beyond precedent because of the beau-

tiful way it has been pictorially illumined. The labor necessary to prepare such a paper is simply immense. Only the labor of love could have produced it, a labor that knows no fatigue and never wearies.

I know I voice the sentiment of all present when I move a vote of thanks to Dr. Andrews for his extremely instructive paper; and I would also include Professors Wortman and Peirce and Dr. Graf, who have so kindly and helpfully participated in the discussion.

The motion was carried unanimously.

Adjourned.

S. E. Davenport, D.D.S., M.D.S.,
Editor The New York Institute of Stomatology.

ANNUAL DINNER—HONORS TO DR. BENJAMIN LORD.

New York, February 23, 1897.

On the evening of February 12, the newly appointed holiday to commemorate the birthday of Abraham Lincoln, The New York Institute of Stomatology held its first annual dinner.

The incentive to this dinner was not exactly what the cynic described as the incentive to matrimony,—"an insane desire on the part of a young man to pay a young woman's board,"—but it was a similar insane desire on the part of all the members to present to Dr. Benjamin Lord, the retiring president, a certificate of good character (as though he needed it), enfolding within every signature a certificate of affection.

The dinner was intended as a family affair, so quarters were selected that did not admit of many invitations outside of the membership, and, as usual with the Institute, there was no special effort and no flourish of trumpets at all, but there sat down to the prettily decorated tables at the Knickerbocker Athletic Club thirty-five gentlemen to do honor to the occasion.

Dr. George S. Allan, this year's president of the Institute, presided, the honored guest, our ex-president, Dr. Lord, sat at his right, and Dr. Eugene H. Smith, dean of the Dental Department of Harvard University, sat at his left.

Facing them, at the foot of the table, which was of a T-shape, sat Dr. C. A. Woodward, chairman of the Executive Committee and of the special committee for the dinner.

It is needless to commend the dinner itself, "actions speak louder than words," and the generally contented hum of conversation showed the satisfaction of the diners.

When coffee was reached, the president called upon Dr. S. E. Davenport, the editor of the Institute and chairman of the committee to procure the testimonial, to take the floor.

Dr. Davenport, in a few well-chosen sentences, recited some of the difficulties that had been encountered in the organization of this new society and the manner in which our venerated ex-president had met and conquered them.

He brought to the minds of the gentlemen present the continuous labors of Dr. Lord in the interests of the Institute, and shortly closed by offering to him an engrossed testimonial, appropriately worded and prettily framed, and signed by every active member of the Institute.

Dr. Lord, in replying to this very delicate and touching tribute, was not at all so sure that he had always been good, and was quite inclined to depreciate the merits of his own administration, something to which the members were not inclined to listen. Dr. Lord presently took refuge in the expedient of passing to Dr. Elliott, the secretary, an unpublished history of certain lines of American dentistry of great interest, enumerating among other things the fact that Longfellow's hero, Paul Revere, was a dentist, and giving one of Revere's advertisements taken from the *Boston Gazette* of December 19, 1768. This history also set forth in some detail some of the difficulties experienced by the Father of his Country when once he tried to change dentists and have a new set of teeth made, and further explaining how the Stuart portraits of Washington obtained the horrible mouth which characterizes them, by means of cotton rolls which had been placed beneath the lips in the vain effort to restore a former expression.

After this history, Dr. Smith, of the Harvard School, made a short address of congratulation to the Institute upon the progress it had made in assuming broader and higher grounds of study than are usually found among dental bodies, and instanced the present company assembled in proof of their success.

He then presented for the examination of the Institute some plaster models of a case of irregular teeth where one or two teeth were missing.

With these models he presented four X-ray photographs of the same mouth, taken by our colaborer, Dr. Clapp, of Boston, and exhibiting the missing teeth well up in the alveolus, thus giving some indications as to the mode of treatment that may be possible.

Dr. Farrar was then called upon and gave an interesting ac-

count of dental historical matters which were quite new to most, if not all, of those present.

It seems that Dr. Farrar went quite deeply into dental history at one time, but eventually turned his attention more particularly to dental orthopædics, of which his great work is the result.

Dr. Cook, of Brooklyn, was called on for a few words, but thought the occasion too happy to be added to by any of his immature remarks, and no persuasion or cheering could make him think to the contrary.

The president thereupon began to abuse one of the honorary members, who in pure self-defence had to rise for reply, when Dr. Allan introduced Dr. Dawbarn, professor of Surgery at the Polyclinic College and Hospital. The doctor spoke but a very short time, keeping his auditors wide awake and sharply attentive, and at an early hour, as becomes the young, this youngest of the dental societies went home.

E. A. B.

Editorial.

REORGANIZATION.

UNDER the heading of Original Communications will be found in the present number a very suggestive article by Professor Fillebrown, chairman of the committee appointed by the American Dental Association, in 1894, to take into consideration the subject of the union of the American with the Southern Association. While this article does not claim to embody all the thoughts of the joint committees, it evidently may be regarded as voicing the general sentiment, and it is, therefore, especially worthy of serious thought.

It is eminently proper before making a final report to the meetings to be held at Old Point Comfort, in August next, that the committee should formulate a preliminary plan in order that the subject may be crystallized in the minds of the dental profession throughout the country, and thus be prepared for the discussion of the topic in all sections, and enable those who expect to be present at Old Point Comfort to bring with them their best and most matured reflections.

The change proposed is a radical one, and will require, and doubtless will receive, careful consideration. That it will invite opposition is more than probable, for old attachments cannot be uprooted in an hour or even in years, but, as we are obliged to part at some period with our loves and hopes in this unstable life of ours, it may be that the time has arrived for the death of the old in associative effort and the birth of a more active body.

It has been apparent for a long time, as intimated in a former article on this subject, that present methods have outlived their usefulness; that the dental profession was wasting its efforts, with weakened results, in lack of concentration. Society after society has been formed and combinations of societies have been organized to cover certain districts to an extent that diminishes power, while, at the same time, it increases the demand for papers which the limited range of thought and practice in dentistry will not and cannot supply.

With this fact in view, it certainly becomes each interested member of the dental profession of this part of the world to calmly consider whether it may not be better to make sacrifices of feeling and even bury old loves that the younger generation may open the coming century with a more vigorous associative life.

The writer sympathizes with the old feeling, and when this idea of the committee was first brought to his attention it was met with a positive degree of repugnance, but a calmer consideration leads, if not to acceptance, at least to a willingness to accord to it recognition and judicial examination that in the end all may become more thoroughly united in our work.

The details as worked out in the article of Professor Fillebrown cannot be considered at this time. The majority of them are valuable and some of them are objectionable in a new organization, but these will come up for consideration in the future. The main point is to have all workers in the dental ranks think over the subject and be prepared to act.

There is one excellent feature in a new organization that must recommend it to the young, and that is that a body such as proposed offers an opportunity for a new and more vigorous element to enter and take part in its deliberations. There is nothing more difficult for young persons than to enter as members in an old organization and attempt an active participation in its work. The old members too frequently regard their presence as not an element of strength, and the young feel the crushing effect of age and experience. For a time, at least, all, young and old, would be prac-

tically upon the same level, and thus an opportunity would be given for the infusion of new life and more energetic methods.

There is one thing which, in the opinion of the writer, should be avoided, and that is a subserviency to old methods of organization. We have as a branch of the medical profession followed too long its plans, as though nothing could be evolved of a better character. When it became necessary for the more perfect arrangement of college work, a few stepped aside from old ruts and organized, with some degree of timidity, the National Association of Dental Faculties. That was truly an original conception, and the success attained warranted the effort, for it not only has advanced the standard of dental education, but has made a path for the medical colleges to follow.

This example should be an incentive to try and organize a distinctively original body, and not to copy old lines entirely, as the suggestions seem to indicate as the purpose of the committee.

It will take time to complete the organizations proposed, and probably the new century will have opened before even the central association, if decided upon, will have been properly in complete working order, but better delay than that any mistake should be made.

It is hoped that all societies will send strong delegations down to Old Point Comfort, and in order that these may be intelligent upon the subject, the matter should be given time for thorough discussion in all dental bodies throughout the length and breadth of the land, for it is only by this interchange of thought that the right course to pursue can intelligently be marked out.

IS IT JUST?

Upon another page of this number will be found a severe criticism of the New York Dental College, quoted in part from the New York *Tribune*. The college may or may not deserve the castigation given by the president of the Massachusetts Dental Society, but the impression left upon the minds of readers will be that this college is a State institution. The understanding has always been that it was founded upon a charter granted by the State of New York, and supported by private funds. It is presumed its organization partook somewhat of the character of a partnership concern, the faculty furnishing the means to sustain it. If this be so,

it seems hardly proper to complain that the faculty have done a great wrong, that after expending all required on the students' training they divided the surplus. The question of amount is not to be considered; for if it be wrong to divide forty-five thousand, it would be equally wrong to divide forty-five hundred, or any lesser amount. It is simply a matter of legitimate business, and might with equal propriety apply as well to the prosperous dentist who invests his surplus yearly.

Whether colleges are right or wrong in being thus organized is not the question at issue; but had dental education waited until States, universities, and medical colleges were ready to proffer the means necessary to sustain them, it is safe to assume that dental training would be to-day where it was in 1850. The history of the financial sacrifices made by dental faculties to educate the dental profession to a higher standard of training, as well as that of the public, has never been written, and probably will never be appreciated.

It is presumed the faculty of the New York College of Dentistry can speak for itself, if so disposed; but in our judgment the arraignment of a school, presumably owned by the faculty, for dividing the profits as their remuneration, is on its face, and in the absence of more definite information, very unjust.

Bibliography.

A Practical Treatise on Artificial Crown- and Bridge-Work. By George Evans, Lecturer on Crown- and Bridge-Work at the Baltimore College of Dental Surgery, etc. Fifth edition, revised. With six hundred and twenty-five illustrations. The S. S. White Dental Manufacturing Co., Philadelphia, 1896.

The issuing of a fifth edition of a work in a few years is a sure evidence that it has been appreciated by those it has been intended to serve. This work of Dr. Evans has passed the stage of criticism, and has become a standard text-book upon the subjects treated.

It was reviewed in this journal in its third edition in 1893, and since then it has steadily improved. "Obsolete matters have been

omitted, descriptions of unimportant variations have been curtailed, repetitions avoided as far as possible."

The explanations of the various processes in forming crowns are clear and concise, and it would seem as though any one familiar with plate-work could not fail to become skilled in the work by faithfully following these in practice. Unfortunately this is not always the case, and unskilful work in preparation and insertion is too frequently in evidence.

A considerable portion of the book is devoted to "bridge-work," permanent and removable. It is a question whether permanent bridge-work will exist as part of dentistry in the coming time. There is a growing feeling, in which the writer sympathizes, that this process is fast reaching the stage of a professional abomination. The fact that so much space is given to removable bridge-work indicates the drift of sentiment away from earlier methods. That the author does not quite agree with this view is to be expected, and he, therefore, devotes time and space to its elucidation.

As a text-book for students and reference-book for advanced practitioners this work of Dr. Evans can most cordially be recommended, and it is probable it will remain without a competitor in this line of work for a long period.

Current News.

DENTAL SOCIETY OF THE STATE OF NEW YORK.

The Twenty-ninth Annual Meeting of this Society will be held in Albany, May 12 and 13, at which time the following programme will be presented:

President's Annual Address, H. J. Burkhart, D.D.S.

Report of the Correspondent, R. Ottolengui, M.D.S.

Report of the Committee on Practice, A. R. Starr, D.D.S.

"Amalgam Fillings, with a Practical Demonstration," G. V. Black, M.D., D.D.S., Sc.D., Jacksonville, Ill.

"Dental Organizations," James Truman, D.D.S., Philadelphia.

"Irregularities of the Teeth and their Correction," J. N. Farrar, M.D., D.D.S., New York.

"Cataphoresis," H. W. Gillett, D.M.D., Newport, R. I.

Subject to be announced, B. Holly Smith, M.D., D.D.S., Baltimore.

Members of the profession are fraternally invited to attend.

H. J. Burkhart, D.D.S., Batavia,
President.

C. S. Butler, D.D.S., Buffalo,
Secretary.

HARVARD ODONTOLOGICAL SOCIETY.

At the Nineteenth Annual Meeting of the Harvard Odontological Society, held at Young's Hotel, February 27, 1897, the following officers were elected: President, Waldo E. Boardman, D.M.D., 184 Boylston Street, Boston; Recording Secretary, Joseph T. Paul, D.M.D., 157 Newbury Street, Boston; Corresponding Secretary, Edward B. Hitchcock, M.D., D.M.D., Newton, Mass.; Treasurer, Lyman F. Bigelow, D.M.D., 194 Marlborough Street, Boston; Editor, Henry L. Upham, D.M.D., 128 Charles Street, Boston.

Executive Committee.—Joseph T. Paul, D.M.D., chairman; Frank T. Taylor, D.M.D., William P. Cooke, D.M.D.

Edward B. Hitchcock,
Corresponding Secretary.

RECENT PATENTS.

The following is a list of dental patents granted during the past week and reported for the International Dental Journal:

No. 576,593. Dental appliance. H. S. Lowrey, Kansas City, Mo. Filed March 28, 1896.

No. 576,648. Dental surgeon's knife. Wm. Autenrieth, Cincinnati, Ohio. Filed April 27, 1896.

No. 576,654. Dental syringe. W. C. Bunce, Oberlin, Ohio. Filed April 8, 1896.

No. 576,722. Tool-moistening device for dental hand-piece. Wm. Caille, New York City. Filed October 15, 1896.

No. 576,818. Dental spraying apparatus. W. J. McGraw, Walla Walla, Wash. Filed September 23, 1895.

No. 577,063. Dental hand-piece. J. T. Pedersen, Woodside, N. Y. Filed January 6, 1896.

No. 577,064. Slip joint for dental hand-piece. J. T. Pedersen, Woodside, N. Y. Filed March 2, 1896.

No. 577,254. Means for raising and lowering dental chairs. H. E. Hawksworth, Philadelphia, Pa., assignor to S. S. White Dental Manufacturing Co., same place. Filed October 17, 1896.

No. 577,309. Vulcanizer. F. W. Morgan, P. L. Clark, and J. E. Parker, Chicago, Ill., assignor to Rufus Wright, same place. Filed January 31, 1896.

Trade-Mark No. 29,565. Dental antiseptic tablets. Arthur C. Liepe, Milwaukee, Wis.

Selections.

PEROXIDE OF HYDROGEN IN WOUND TREATMENT.

Dr. Neudorffer recommends a two-and-a-half-per-cent. solution of peroxide of hydrogen as a hæmostatic and disinfectant in the treatment of wounds. Through the action of the hydrogen peroxide the fibrin of the blood is separated in minute microscopic fibres, resulting in a local defebrinization of the blood, whereby the harmless little clots close the wounded surface from the surrounding tissue.

The peroxide of hydrogen solution is applied by means of pledgets of absorbent cotton, which are well pressed, leaving them only damp; in this manner they are applied to the bleeding surface only but a second.

Peroxide of hydrogen, according to Neudorffer, may also be used in severe cases of hemorrhage, as bleeding from the nose, where a simple sponging or wiping of the nasal cavities or passages with a two-and-a-half-per-cent. solution usually checks the bleeding; or a similar result may be obtained by inhaling the solution five or six times through the nostrils in the form of a spray, taking deep inhalations at the time.

THE

International Dental Journal.

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Original Communications.[1]

CROWN- AND BRIDGE-WORK.[2]

BY FRED. A. PEESO, D.D.S.

MR. PRESIDENT AND GENTLEMEN,—I feel greatly honored in having been asked to read a paper before this society. With full appreciation of the courtesy extended to me, it was nevertheless with considerable trepidation that I undertook to comply. While I may not have much to present to you which is strikingly new and original, I have written with the hope that some new light might be thrown on old ideas.

It would be presumption on my part to come before you in the attitude of a teacher. I prefer to be looked upon as a fellow-student in considering the subject which has been assigned me, and if in the reading of this paper and the discussion which follows you may be able to glean some points of value from me, and I from you, I shall esteem myself amply rewarded. The methods which I shall attempt to describe have proved most satisfactory in my practice, some of them having cost me much hard work both at the chair and in the laboratory. Crown- and bridge-work is one of the most important branches taught in our schools, for

[1] The editor and publishers are not responsible for the views of authors of papers published in this department, nor for any claim to novelty, or otherwise, that may be made by them. No papers will be received for this department that have appeared in any other journal published in the country.

[2] Read before the New York Institute of Stomatology, February, 1897.

the reason that more harm may result to patients from its improper use than from any other cause.

While comparatively new, it has still been long enough before the public to prove that it has its place in dentistry. It has perhaps caused more controversy than anything connected with the profession,—and the arguments for and against are both right and wrong. While some enthusiasts claim everything for it, others go so far as to say that it has no place at all in dentistry, and maintain that it is malpractice to use it.

Few new ideas have been presented that have not at first been scoffed at, but most of them have proved in some way useful; and often this very antagonism promotes their growth and brings about the desired result. This has been the case with bridge-work. The opposition it has had to contend with from the start has caused those interested in it to strive to eliminate the weak points, until to-day it is a most valuable adjunct to the profession. To make the work successful, good judgment and skill are required on the part of the one doing it. The principal elements entering into a successful operation are, first, a healthy condition of the mouth and teeth or roots to be used as abutments; second, their proper preparation to receive the attachments; third, accurate fitting of caps and bands; and, fourth, perfect articulation. Any one of these conditions ignored, failure may ensue. The thought of wearing a plate is repugnant to most people, but the same prejudice does not exist against bridge-work. If instead of a partial plate one or more bridges be placed, there is nothing that will please the patient more or give him more lasting satisfaction. A fine filling or a plate may gratify, but not as a nicely finished and well-fitted bridge. Unquestionably a large part of the work done is not only unfit to be put in the mouth but is a positive injury to the patient.

Before advising the placing of a bridge care should be taken to see that the teeth are in good condition and sufficiently strong to do the work imposed. Too much strain should not be put on a single tooth or root. Ordinarily two good roots will support a bridge of three or four teeth, and I have seen satisfactory cases of even five that have been in for a number of years, but that is rather more than is generally advisable. I am speaking now more particularly of permanent fixtures. It is perfectly safe to put a full denture on the two cuspids and the two first or second molars. A piece of this kind is very strong, as there is little lateral motion, and each side helps to support the other. A cuspid and first molar

and very often the second molar will form safe anchorages. The two centrals will carry the two laterals and the laterals the centrals. Frequently the canines may serve to carry the four incisors if they stand well apart, and the teeth may be placed nearly in a straight line, but if the arch is narrow and very much curved the leverage would be so great as to eventually loosen the abutments. Removable work gives much wider field of operation, as by the employment of the saddle a piece may be extended beyond the anchorages. This is especially true of the lower, where by utilizing the bicuspids or cuspids most of the posterior teeth may be restored, particularly if there is a good ridge.

In the preparation of the teeth and roots the greatest care should be used; for if not properly done the chances are against the work proving satisfactory. While the trimming of the teeth seems like a simple operation, it is by no means easy. The operator should always have in mind what the shape of the tooth would be if it were cut across just below the gum line. The swell should be entirely taken off to about one-sixteenth of an inch below, leaving the sides parallel, or slightly larger at that point, so that when the band is passed over it will hug the neck tightly. If the tooth is larger near the cusp than below the gum, the band, when put on, instead of passing between the tooth and gum cuts into the gum, and when cemented the cement will present a rough, jagged surface which will be a constant source of irritation. An explorer should be used constantly, and trimming should continue as long as the least particle of enamel or the least ridge can be felt. In all of the teeth the bulk of the trimming will be on the mesial and distal surfaces, the swell being greater at those points.

Looking down on a lower molar after it has been shaped, it will be seen to be nearly square, with the corners rounded, being slightly wider at the mesial than at the distal side, owing to the anterior root being larger. (Fig. 1.) The upper molars will be somewhat triangular, being broader on the buccal side because of the two buccal roots being larger than the palatal. Occasionally this may vary, but not often. (Fig. 2.) In the bicuspids, cuspids, and laterals the roots are egg-shaped, with the base towards the labial side (Fig. 3), the bicuspid being long and narrow.

The shape of the centrals is always nearly a perfect triangle with rounded corners. (Fig. 4.)

In any of the anterior teeth, if the enamel be entirely removed, the root will be of the proper shape to receive the band, as the

greatest circumference of the body of the tooth is at the junction of the enamel with the dentine. (Fig. 5.)

In opening a canal in such a tooth, it will be found that if its direction be not changed the pin will come wholly or partly under the facing, which necessitates the grinding away of the pin so as to leave it attached only to the thin floor of the cap, or grinding the facing. (Fig. 6.) If in enlarging the canal the reamer be pressed towards the palatal side of the root, thus sloping the canal in that direction, and then, by bending the pin slightly, plenty of room will be left in front of it for the facing. (Fig. 7.) The pin, too, should be long and heavy enough to support the crown. Very frequently a patient presents to have a crown reset, perhaps a large cuspid or central, having a pin not more than three-sixteenths or one-fourth of an inch in length and of No. 16 or 17 wire, where No. 13 or 14 of three-eighths or one-half inch in length could have been used. In opening the canal, the length should first be ascertained by passing a fine broach through the apical foramen, the pin then being made long enough and large enough to give all the strength required. In looking after details like these much time may be saved and success assured.

The instruments used for the preparation of the teeth and roots are numerous, and all have their advocates. Those I have found most useful are the following:

For grinding down the cusps for metal crowns, or any of the anterior teeth for porcelain-faced crowns, a square-edged corundum or carborundum wheel is probably the best. For trimming the sides of molars and bicuspids a diamond disk or thin corundum disk is indispensable, and for rounding corners and parts that cannot be reached with the disks, a little cup-shaped corundum (S. S. White's No. 11) is necessary. (Fig. 8.) I had some steel cutters made after the No. 11 model, cut same as finishing burs, which do the work well. Perhaps the most difficult place in the mouth to reach is the anterior surface of the lower molars. For this it is necessary to have a saucer-shaped disk, as with the ordinary straight wheel the angle is such that the tooth cannot be trimmed at the neck without cutting far back into the crown. (Fig. 9.) By taking a thin mounted corundum, holding it near the flame of a spirit lamp or Bunsen burner, and pressing the thumb or a stick against the back while revolving rapidly, the wheel will be softened and a concave disk formed which will answer every purpose. (Fig. A.)

After a tooth for a porcelain-faced crown has been ground down, for levelling the surface and cutting it below the gum margin at

FIG. 1.

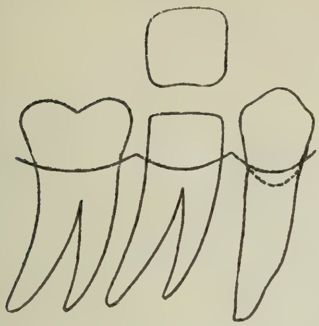


FIG. 2.

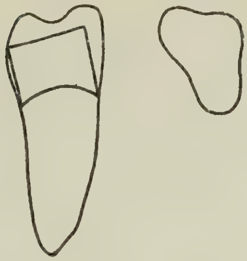


FIG. 3.

FIG. 4.

FIG. A.

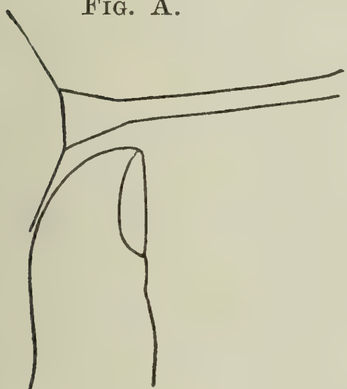


FIG. 5.

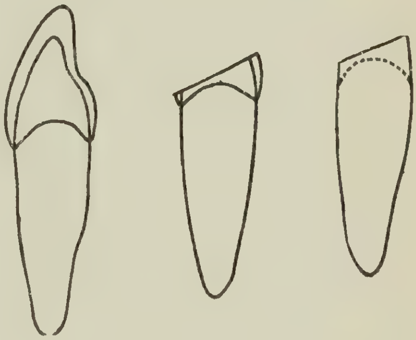


FIG. 6.

FIG. 7.

Fig. 8.

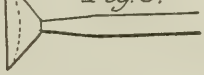


Fig. 9.

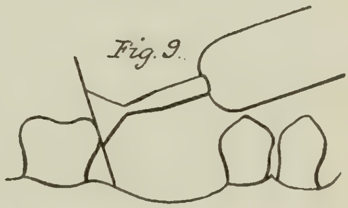


Fig. 10.

Fig. 13.

Fig. 14.

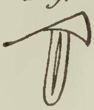


Fig. 12.

Fig. 15.

Fig. 16.

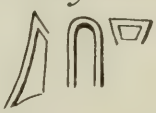


Fig. 11

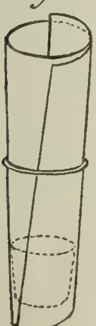


Fig. 19

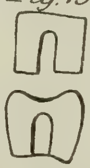


Fig. 20.

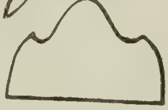


Fig. 17 & 18.

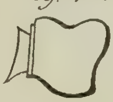


Fig. 21.

Fig. 22

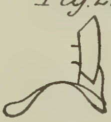
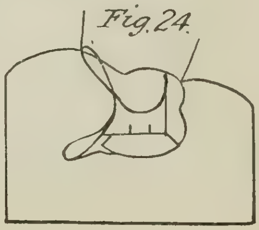


Fig. 23.

Fig. 24.



the labial side, the root-facers, designed by Dr. Ottolengui and bearing his name, are the only instruments suitable, and will hardly be improved upon. For enlarging the canals I use an instrument bearing my name, which is something like the reamers of Dr. Ottolengui, but the sides are parallel to near the end, where it tapers to a safe point, same as the Gates-Glidden drills. They are designed for straight pins, but by leaning them to either side they can be used for Logan or other taper pin crowns. For stripping the enamel from the anterior roots, the Nos. 3 and 7 scalers of S. S. White's do the work better than any trimmers I have ever used. The No. 3 is used for the labial and palatal sides, and the No. 7 on the mesial and distal, where the space is narrow.

After the mouth is prepared, the work can be wholly or partly done on the model. In the anterior teeth, or where the roots are cut below the gum, it is best to fit the bands in the mouth. In other cases the work can be better done on a plaster model. Take, for example, a bridge from cuspid to molar. In preparing for a removable, the attachments should be slightly diverging or converging, so that there may be a slight natural spring of the parts to help hold the piece firm. This applies to all removable work. The band and cap are first made for the cuspid, the tube soldered in place, and an impression taken, being careful to have an accurate one of the molar. The impression can be taken and a wax bite used; but a more accurate method is to take the impression and bite at the same time, by first covering well the abutments, building the plaster up thickly, taking in a few of the adjoining teeth, and then having the patient close the mouth, biting into the soft plaster. Then with a wet spatula the plaster can be pressed around the teeth and gums. After the impression has become hard remove, and carefully fasten the broken parts together with hard wax. Put a little wax on the pin and around the sides inside of the cuspid cap to obliterate any undercut, and fasten in place in the impression. This is then covered with colored sandarac varnish, and the lower side run, letting the plaster extend back from the molars to form the articulator. Notch or groove this, varnish, and run the other side. When hard the impression is cut away and the parts separated. With a pair of heated pliers remove the cuspid cap, clean the wax off, and replace it. In this way a more perfect relation of the teeth may be obtained than with a wax bite, as in pressing the wax on the model it is apt to give more or less, while with the plaster, a piece may be made and articulated so that it

will not have to be touched when placed in the mouth, and if necessary a second bridge could be made from it.

The model should be thoroughly dried with slow heat, and the molar trimmed evenly all around to nearly one-sixteenth of an inch below the gum line, being careful to cut parallel to the sides of the tooth. Then give it several coats of very thin sandarac varnish, which will soak in readily, and when it has taken all that it will, dry thoroughly, and the model will become so hard that the fitting of the band will not mar it.

There are various kinds of attachments used in removable work, the most common of which and the most easily made is the telescope cap, which we will first consider. Its name indicates the principle on which it works, and a few words will explain how it is made. The model being ready, the measurement of the tooth at the gum line should be taken with wire, or an annealed copper strip, which is preferable. Cut the gold a little longer to allow for the lap and on a slight angle so as to make the band a little larger at the neck. Bevel one or both ends, and sweat or solder together with twenty-one-carat solder. After festooning it to follow the gum line, cut off to a point nearly level with the top of the tooth. Press the edges inward all around (Fig. 10), file off even with the tooth, and solder on the floor, using plenty of solder. The corners may then be rounded and the cap polished. Now to make the outer movable cap. First put a thin film of wax on the inside of the cap already made, roll a piece of paper around a pencil or instrument of suitable size, and push the cap through it to near the end. Put a small rubber band around to hold it together and fill with fusible metal, of which mention will be made later. (Fig. 11.) This makes the cap solid, and it can be worked on without injury. Measure with copper strip, cut the gold so that the band will be a little small, bevel the ends to form a smooth joint inside, and sweat or solder with twenty-one-carat solder. The joint may be smoothed on the beck-horn of an anvil and driven on to the supported cap. This gives a perfect fitting telescopic cap such as can be got in no other way. The top should then be pressed in to conform to the inner cap, filled even with it, and a floor soldered to it with twenty-one-carat solder. The lower edge should be parallel with the lower edge of the inner cap, but about one-sixteenth of an inch above it, so that it will come only to or not quite to the gum line. A contour may then be given by soldering pieces of gold to the sides (Fig. 12) and filing off even with the top. A cusp is then selected and soldered on with twenty-carat solder. When the whole is finished it appears

to be an ordinary contoured, full-gold crown. (Fig. 12.) The inner cap is then warmed slightly and the fusible metal pulled away. Any particle of it adhering to the cap should be carefully scraped out and the cap dipped in nitric acid to dissolve any of the metal remaining.

A solid cusp is necessary in this case, and is, I think, preferable in all cases. It makes a stronger crown, will wear better, and be the same color as the band. It is easily made by swaging a very thin piece of pure gold for a matrix and filling with coin or scraps from bands. It may also be made by casting.

For a high-grade solder it has been my custom to melt together a pennyweight of coin gold and six grains of S. S. White's eighteen-carat solder, which makes nearly twenty-one carat and of a color hardly to be distinguished from coin. It requires care in manipulating, but after a little practice it can be worked nicely.

For the cuspid, two or more kinds of attachments may be used. In using a split pin and tube, the cap is made as for a Richmond crown; but in place of a pin, a tube is used which may be made by drilling a No. 14 hole in No. 12 platinum and iridium wire on a jeweller's lathe, or by bevelling the edge of a piece of platinum and iridium plate and rolling it around a piece of wire of the right size, soldering with pure gold without flux to prevent gold from flowing into the tube, driving through it a steel wire slightly larger than the one it was rolled on and closing the end and soldering with pure gold. After the cap has been made drill a hole into the floor over the enlarged canal, put the tube in, fasten with hard wax, remove, invest, and solder, using plenty of solder in order to strengthen attachment to under surface of floor, and allow for countersinking from upper surface. Then face off on a smooth corundum wheel or very fine file, and slightly countersink the opening into the tube. (Fig. 13.) To make the removable part, fit a partial band to the palatal side of the cap extending only to or not quite to the gum line, and on the sides to about where the facing will come. (Fig. 13.) Solder to it a floor, covering the whole cap with twenty-one-carat solder.

Drill through this into the tube, wax the split pin in position, invest and solder with twenty-carat solder. The caps are then placed in position, and if no saddle is to be used, the bridge may be made the same as a stationary piece, waxing to the outer caps. The split pin is made by bending together a piece of half-round platinized gold wire, and turning or filing to fit the tube. It is well to leave the end closed, and it may be spread a little in the middle

with a fine sharp instrument, thus forming a very close elliptic spring, and there is no danger of one side being split away. (Fig. 14.)

Another form of attachment is to let the pin extend through the floor of the cap, bend it so as to bring it nearly in line with the other attachments, fit a tube to it, and solder it in the back of the canine. (Fig. 15.)

A key may also be used, but it is hardly as suitable in connection with a canine as the methods already described. For molars and bicuspids it is excellent and is easily made. Take a piece of platinum-iridium, file it into the required shape, which is something like this (Fig. 16). Bend a piece of the same metal, about thirty-two gauge, around the edges, fitting the sides perfectly. (Fig. 16.) File off even with the broad side of the key, fit a floor to it, and solder with a very little pure gold without flux. The male and female parts are now ready. In using this, the side of the crown to which it is to be attached should preferably be straight and of double thickness. (Fig. 17.) The key is put in position, and a hole drilled through and fastened with a small rivet, having first flowed over the side to be attached to the cap a thin film of pure gold, as the union between this metal and solder is not strong. It is then soldered in position. (Fig. 18.) The female part may then be put on and a thin piece of platinum cut out to slip down over the key next to the cap (Fig. 19) and burnished close to it. It is then waxed in position, removed with the female, and covered with coin gold. After which it may be replaced and the facings ground in. If a saddle is to be used, it is replaced, waxed to the saddle and soldered, and the facings ground in as before.

We now come to the description of the appliance which is practicable only in removable work. This is the saddle. By its use the possibilities of bridge-work are greatly increased. In the upper mouth, where there is sufficient anchorage in front, the bridge may be extended so as to carry one or two teeth, and in the lower even more. Where there are good abutments at either end, or near the ends, pieces of five, six, or more teeth may be made. In making a denture of this kind, the first thing to be done is to make the saddle. The impression may be trimmed to the size and shape wanted, and the model run leaving a ridge all around to where it should extend, or after the model has been made it may be built up with wax so as to make it the same. (Fig. 20.) An impression is then taken in moldine and a die and counter-die of fusible metal made.

The plate is then struck up of pure platinum of No. 28 or No. 30 gauge, with the edges slightly turned. (Fig. 21.) I will say at this point that the fusible metal, of which frequent mention is made, is prepared from a formula given by Dr. C. M. Richmond several years ago in the INTERNATIONAL DENTAL JOURNAL, and is composed of tin, twenty parts; lead, nineteen parts; cadmium, thirteen parts, and bismuth, forty-eight parts, making one hundred parts in all. These are melted in the order named. In my work I have found it indispensable and superior to any other fusible metal I have ever used. It melts at a low temperature, makes a clean die, is very hard, and, with a second die for finishing, almost any metal can be swaged.

The saddle being struck up is covered with coin gold to stiffen it and thicken the edges so that they will not injure the tissues. It is then fitted to the model again, and the surface of the coin ground smooth. If a telescope cap is to be used, they are both placed in position in the mouth, the saddle pressed firmly to place, and held there with an instrument while a plaster impression is taken, after which it is invested and soldered to the outer cap with twenty-carat solder. It is then placed in the mouth again, and an impression and bite taken in plaster. The inner cap is coated on the inside with a film of wax, and the model is made with the articulation as described earlier in this paper. The facings are now ground and placed so as to leave a little space between them and the saddle. Fig. 22 is backed with thin soft platinum which extends to the saddle and is waxed to it. The buccal side is then waxed and carved to represent the gum (Figs. 22 and 23), an impression taken, and a piece of pure gold twenty-four or twenty-six gauge swaged to fit around the teeth. The saddle is then heated slightly, which softens the wax and allows the facings to be removed without changing their position. The pure gold is soldered to the saddle, and the facings replaced. The cusps are then made, fitted, and the pieces are invested so as to leave the back exposed. (Fig. 24.) The wax is then carved to represent the lingual aspect of the teeth, an impression in moldine taken extending from the lower edge of the saddle to the upper surface of the cusps. (Fig. 24.) Make a die and counter-die and swage a back of No. 27 or 28 gauge coin gold and fit same accurately. (After swaging gold or platinum, it should always be dipped in nitric acid to remove any particles of the fusible metal which may be on the surface, as, if the piece is heated while any of it adheres to it, the gold would become slightly alloyed and so brittle as to be useless.) The wax is then removed,

the piece heated up, and soldered with eighteen-carat solder, which is sufficiently fine, as none of it comes to the surface. Enough solder should be used to give all the strength required and to seal it perfectly and no more, as it only increases the weight. (Fig. 24.) The piece should be kept well heated and plenty of solder flowed over the parts which will come in contact with the back. The back is then dipped in flux and dropped in position.

The putting in of this piece is a very delicate operation, and requires the nicest manipulation, as in making the solder flow between the plates the back is very easily burned. However, if the operator is used to the blow-pipe, the piece kept very hot, and a large flame used, there is not much danger.

From this on there is very little trouble. The piece being sufficiently cooled, it is taken from the investment, cleaned in acid, the rough parts ground away, and the final touch before the polishing is given. It will be remembered that there has been a little space left between the facings and the saddle, and a piece of pure gold fitted around the necks of the teeth. (Fig. 22.) This space is filled with cement or plaster of Paris, and after it is thoroughly dried the pure gold is condensed around and against the facings with smooth pluggers and mallet, and the other spaces carefully filled with foil and burnished. The whole piece is then smoothed with fine corundum wheels, and the articulating most carefully done, as the success and comfort of the piece depends largely upon this. A poorly articulated piece, let it be never so well made and finished otherwise, will not prove satisfactory. The cusps are now carved, and the whole finished with pumice, abrada, and rouge. For reaching difficult places cork on an engine mandrel will be found useful. Also hard, thin, knife-edge disks for the lathe are indispensable. A bridge made in this manner comes as near being perfectly clean as one can be made, and if even ordinary care is given it will retain a clean polished surface, and there will never be the least disagreeable odor from it.

The thin, hard disks mentioned will be kept at the dental depots, or a number can be easily made in a very few minutes by the dentist himself. Put an ordinary felt wheel on the screw-chuck of the lathe, and with a thin, sharp knife cut while the lathe is running rapidly, starting near the edge and gradually increasing the thickness to one-eighth or three-sixteenths of an inch at the centre. Three or four can be made from an ordinary felt wheel. They are then dipped in white shellac varnish and dried on a piece of glass or board. When thoroughly dried, put on the chuck again, and while

it is running apply a little heat, at the same time pressing the side with a small stick or a tooth-brush handle. In this way they can be made of any shape desired. When they are cool hold a coarse vulcanite file to the edge of the running disk and bring it to a sharp edge.

For abrada, a soft felt wheel is good, and the same will answer for rouge, having one very soft and thin for getting between the teeth. A soft cotton buff is the best for the final touch, with a brush wheel for the cusps.

The final step, and a highly important one, is the cementing of the piece. You are all familiar with it, so I will consider it briefly. The teeth, roots, and pieces to be cemented should be as dry as it is possible to make them. The cement is mixed to the consistency of thick cream, carried well up into the canals with a blunt instrument, the caps and bands filled, and the bridge forced quickly into position. Plenty of cement should be used, and the caps be perfectly tight, so as to force the cement to every part. If the edges of the band stand away from the neck at any place, it can be pressed in with a burnisher, and after the cement has hardened a little, the excess can be removed with an explorer. An opening should not be left in the cap to allow the surplus to escape, as is the custom with some, for the cement, instead of reaching every crevice, might find its way through this vent.

For this work I have found nothing equal to Weston's "cement for bridge-work." It sets very quickly, and the surplus can be removed from around the parts almost as soon as the piece has been put on. Those without experience would do well to mix two or three lots before trying to use it in the mouth. Otherwise they may get caught with a piece partly on which they can neither get to place nor remove.

It would do no harm to emphasize a few things which might prove disastrous. Do not expect too much of a tooth, and put a bridge of five or six teeth where there should be only three or four. Do not put a cap or band on until sure that the last bit of enamel has been removed. Do not use a pin one-quarter of an inch in length where it should be one-half inch. Do not in opening up the canal perforate the roots, and, lastly, do not put a piece in the mouth until it is properly articulated. By keeping in mind these points, a satisfactory bridge may be made which will last beyond the limit placed by some as the life of the work. A few minutes before penning these words, I read this following extract from a journal: "If a bridge lasts three or four years it has done

all that could be expected of it, and the dentist has fulfilled his obligation to the patient." If it would last no longer than that it would certainly be a failure.

METHODS OF CONTROLLING THE ELECTRIC CURRENT IN CATAPHORESIS.

BY WILLIAM ST. GEORGE ELLIOTT, JR.

In this paper it is proposed to go into a comparative study of the principles employed in controlling the electric current in *cataphoresis as applied to dentistry.*

In general, it may be said that all electricity derived from batteries or constant-current dynamos is identical, as far as we need concern ourselves, and that the same laws apply to both. The strength of the dynamo or street current, its liability to a sudden and possibly dangerous increase of potential, as well as possible variations within small limits, render it necessary to consider both separately.

Electrically, any principle controlling the current as well as another principle is equal to it in efficiency. Practically, however, there are vast differences in apparatus, even when working on the same principle. Mechanically, that apparatus is the most perfect which thoroughly fulfils the requirements, while having itself the simplest and fewest parts.

The requirements of a perfect dental apparatus are:

The apparatus should be capable of turning on or shutting off the current without shock to the patient, and during the early stages of an operation should permit of very gradual increase of current strength. It should be capable of supplying a maximum pressure of fifty volts. The movement of one handle should be all that is required to control the whole current. And last, though of great importance, and usually overlooked by the manufacturers, the apparatus should occupy as little cubic space as possible.

In very sensitive cases—that is, in cases not necessarily very sensitive to the bur, yet very sensitive to the current—it has been found that a current of one-thirtieth milliampère, if suddenly applied, causes a slight shock. This makes it necessary that when we apply the electrodes the patient should not be subject to over one-tenth volt pressure to begin with. The average resistance of a tooth

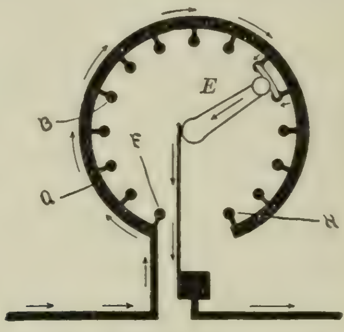
is probably over thirty thousand ohms. In some cases, however, where the cavity is a deep one and the apical foramen large the resistance may not be over three thousand ohms. These cases must, of course, be provided for in a good apparatus.

The current is apt to be painful in the early stages of an operation, and less so near the completion of anæsthesia. It is thought that the reason for this is that the current in passing from the electrode through the body must first traverse only a few cells, and that these increase in number and consequent area the farther it goes into the body. Now, it is a well-known fact that a cell can only stand a certain strength of current without pain, and that the amount depends on the kind and condition of the cell. Consequently, if the current must first pass through a few cells, and these are sensitive to the current, only a small amount can painlessly pass. As the cataphoric effect penetrates, however, it deprives the cells of sensation, thus enabling more current to be passed. This is accomplished by creating a greater difference of potential at the ends of the cells, which, of course, induces the current to spread and seek additional paths, and so on till the full current is passing.

The current for our purpose is controlled by resistances placed in various ways in the circuit. These resistances are usually capable of being switched in or out of use. The combined resistances and switch controlling the same is called a *rheostat*.

Fig. 1 shows diagrammatically the electrical connections for any form of rheostat.

Fig. 1.



The current follows the path indicated by the arrows. *A* is a body of high resistance. The steps *B* are connected to *A*. *E* is a rotable arm collecting the current from the steps with which it is in contact. *F* is a brush collecting the current from the arm. When the arm is at *H* all the resistance is in use, and the smallest possible current is passing; when at *F* all the resistance is out and the largest possible current is passing.

The resistant part of rheostats is either made of a homogeneous body of high resistance, such as carbon, on which the arm slides, called here *sliding rheostats*, or the body is made of a number of

high resistances connected together, the arm connecting with two or more at a time, called *step rheostats.*

Sliding rheostats, when properly made, control the current by amounts corresponding with the movement of the arm. Theoretically, it is possible to vary the current to any degree of fineness by moving the arm ever so little. Practically, this form is often made of carbon of unequal thickness and uneven shape, thus causing the current to vary by jumps. Another objection is that the arm slides on the carbon, thus coating it with a thin metallic film, which, of course, alters the resistance.

Step rheostats are made with metal-wearing surfaces, and for this reason are far more reliable than the sliding form. They are, however, open to the objection that unless the resistance between the steps is small, the sudden variation is apt to be painful. This makes it necessary to have a large number of steps, and this is only possible in a few of the more compact rheostats on the market. The wide range possible, however, as well as great reliability makes this form generally preferred. But those forms in which the sliding contacts are boxed up so that no one but the makers can inspect the interior arrangements cannot be left too severely alone. Human handicraft is fallible, and therefore no matter how carefully such devices may be said to be made, accidents will happen, and when they do, however trifling the damage, the apparatus must go to the makers for repairs.

All rheostats for dental purposes should be made to turn on the current by very small steps when a small current is passing, and by progressively larger steps as more current is turned on. The first few early steps should vary by one-tenth volt, and the last step by say two volts, when fifty volts is the maximum.

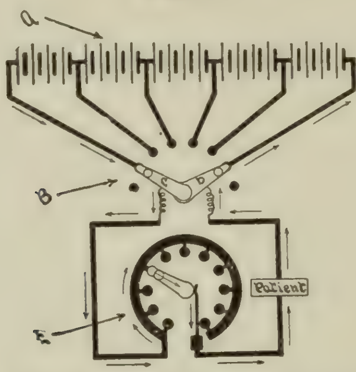
Most rheostats alter the voltage of the steps by a regular and fixed amount. A far better way is to alter the voltage by a regular percentage. Thus, if we should begin with 0.100 volt, the next step would be, say, 0.104, and the last step two volts. This is supposing we have a maximum of fifty volts, and at all times take four per cent. of the current as the amount of increase for the next step.

There are two general methods employed in regulating the current. In one all the current passes directly through the patient,—the *direct method.* The other divides the current and passes the current traversing one of the branches through the patient, the other branch being used, by means of a rheostat, to regulate the amount of current passing through the first branch,—the *shunt method.*

DIRECT SYSTEM,—USING A BATTERY.

Fig. 2 shows the general arrangement for such a system. As will be seen, the current passes directly through the patient as well as the rheostat. In any closed circuit the current passing any point at any time is equal to that passing any other point at

Fig. 2.



A represents a battery of cells connected together in sections, and in lots of four each. *B* is the cell-selector. The arms *C, D* are insulated from each other. By moving the arms it is possible to select any lot of cells, or any number of lots. The cell-selector roughly controls the current strength ; the rheostat *E* controls the current within the limits desired.

the same time. Now, if we wish to increase the current we must increase the pressure or diminish the resistance. There is no other way of doing it. Again, the strength of current passing through any particle depends on the difference of pressure at the points of entry and exit. If we wish to double the current we must double this difference. Conversely, if we double the current we have doubled the difference, or it would not force twice the current through. This is mentioned to show that the so-called volt-selectors have no advantage in this respect over the direct controllers. A numerical example may perhaps show more clearly how impossible it is to alter the current passing through the patient without altering at the same time the difference of pressure to which the patient is subject. In the examples that will be given it was thought best to neglect the internal resistance of the battery as well as the resistance of the line. In doing this we will not affect the general correctness of the conclusions, while not to do it would unnecessarily complicate matters. We will also take it for granted that the resistance of the patient remains constant.

Example.—Let us suppose we have a battery with sufficient cells in use to give a pressure of 10 volts, and have in circuit a rheostat of maximum resistance of 100,000 ohms, and a patient of 10,000 ohms resistance. The current passing through the patient will be

($C = \frac{E}{R} = \frac{10}{110000} = \frac{1}{11000}$) $\frac{1}{11}$ of a milliampère, and the patient will be subject to a pressure of ($E = CR = \frac{10000}{11000} = \frac{10}{11}$) practically one volt as soon as the electrode touches him. Now, let us take out all of the 100,000 resistance of rheostat; the patient will then receive a current ($C = \frac{E}{R} = \frac{10}{10000} = \frac{1}{1000}$) of one milliampère and a pressure of ($E = CR = \frac{10000}{1000} = 10$) ten volts. If we used fifty volts in the above example we would get a current of one-half a milliampère and a pressure of four and one-half volts as soon as the electrodes touch the patient, even with all the resistance of the rheostat in use.

There are few rheostats on the market suitable for dental use having a maximum resistance of over one hundred thousand ohms. The above examples show that with only ten volts the patient would receive one volt pressure as soon as the electrode touched the tooth. This is ten times too much for some cases, so that with such a patient and rheostat we could only use one or two cells to begin with. It is for this reason that a cell-selector is necessary.

DIRECT SYSTEM,—USING THE STREET CURRENT.

The usual pressure for incandescent circuits is one hundred and ten volts; fifty volts, however, is sufficient for all dental use, including bleaching. We therefore have sixty volts more pressure than we need, and this in this system can only be got rid of by placing resistances in the circuit so as to choke down the pressure just that much. In considering this system applied to batteries we saw that in the early stages even ten volts would cause a shock. Consequently, it is as necessary with the street current as with batteries to roughly control the voltage before it reaches the fine rheostat. This is done by placing a second rheostat in circuit.

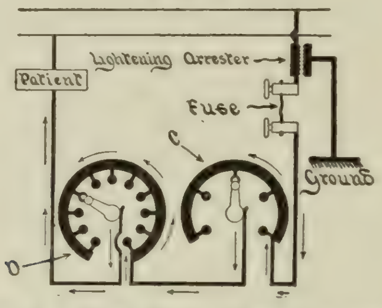
Fig. 3 shows such an arrangement.

Let us now consider what resistance the circuit must give to the current. If we wish to send a minimum current of $\frac{1}{30}$ milliampère, the total resistance, including patient, must be ($R = \frac{E}{C} = \frac{110}{\frac{1}{30000}} = 3{,}300{,}000$) three million three hundred thousand ohms. This resistance is very large.

If we are sending a certain current through the patient, and any variation of potential should occur in the main line, the increased pressure must increase the current going through the patient by an amount exactly proportional to this variation. Consequently, if the pressure in the line be doubled, the patient would receive double the current he did before. If the wire should

come in contact with a trolley wire the increase would be four hundred and fifty per cent., provided the fuses in the main line did not burn out. Practically, however, these fuses do burn out and turn off the current when only a slight increase occurs in the pressure. Indeed, the modern magnetic cut-offs can be adjusted to break the circuit at any desired increase of pressure

FIG. 3.



The fusible plug is adjusted to fuse if more than the previously determined current passes. *C* is a rheostat adapted to roughly control the current, by jumps of, say, ten volts at a time. *D* controls the current uncontrolled by *C*.

above the normal. These cut-offs are placed on every properly equipped line. We see from the above that there is practically no danger in using the street current as far as variations in the line are concerned. The variations within small limits may be so frequent, however, that they destroy the utility of the apparatus. The cataphoric lines should have fuses adjusted to burn out at from five to ten milliampères, and should also be provided with a lightning arrester. The lightning might jump the fuse posts, but with the modern magnetic arresters there is little danger of this. There is, however, always a certain element of danger from lightning during a thunder storm if the lines are not underground. When underground there is absolutely no danger from this source.

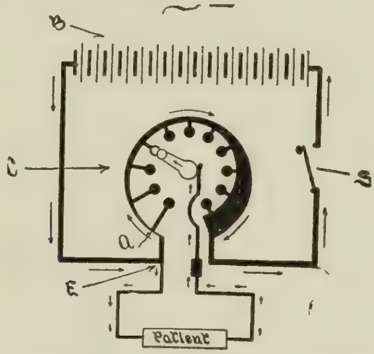
SHUNT METHOD,—WITH BATTERY.

Fig. 4 shows such a system in outline. As will be seen, the current is split into two branches, one going through the patient and the other through all the resistances of the rheostat.

When the arm is at one terminal, *A*, there is, obviously, no electrical resistance between it and the terminal. When it is away from the terminal there will be a certain electrical resistance between the two, and this will increase the farther the arm is from the terminal. Now, we have seen that a resistance needs pressure to overcome it, and as the main current is flowing through the

rheostat, it is evident that the farther the arm goes from A the greater the difference of pressure between it and the terminal. But the arm and the terminal form the respective terminals of the shunt or patient's line, and therefore the patient is subject to an increased difference of pressure the farther the arm goes from the

Fig. 4.



B represents a battery of cells; *S*, a switch; *C*, a rheostat in which the main current passes through all the resistance. The shunt branch is connected to the arm, and one terminal, *E*. The unequal thickness of the resistant material represents diagrammatically its varying resistance.

terminal A. It is on this old and well-known electrical principle that the so-called volt-selectors work. The voltage is 0 when the arm touches the terminal A, and depends for its maximum strength on the strength of the battery. If the battery is strong enough to supply sufficient current for both branches, the maximum potential of the terminals of the shunt circuit is independent of the resistance of the rheostat. As all batteries are capable of supplying more current than is needed in cataphoresis, and as the resistance of the rheostat can be large, the potential difference of battery will practically be unchanged by the additional current sent through the patient. The maximum potential on shunt circuit will also be that of the battery terminals.

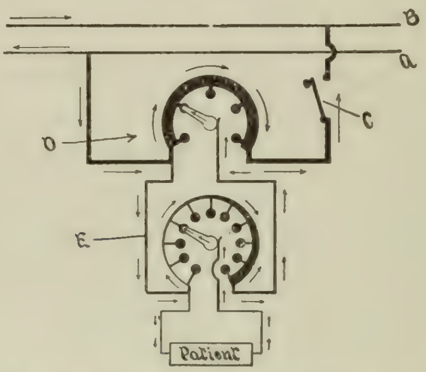
In this system, then, we divide up the whole potential, as no matter how great the potential we always get 0 at one end and the full possible pressure at the other. In this respect this system is far superior to the direct. If we have a rheostat with say 100 steps, and a pressure of five volts, each step will vary the pressure by an average of $\frac{5}{100} = \frac{1}{20}$ volt. If we have 50 volts each step will vary the pressure by $\frac{50}{100} = \frac{1}{2}$ volt on an average, but it is best to make this variation very much less in starting, and several times greater than one-half volt when all the current is flowing; though the average may still be one-half volt. This shows that unless the steps are very numerous (a minimum of 100) a cell-selector is re-

quired. The divisions of the cells, however, need not be as numerous as in the direct system. The objection some raise to this system is that a part of the current is wasted. This, however, is of little moment, as the current in the main branch need not exceed two or three milliampères. A more serious objection is the fact that a switch is needed to turn on and off the current. The dentist is apt to forget that the current is on and leave it on, only to find when next he needs the battery that the battery is much weakened if not entirely used up. But this can easily be remedied by making the arm move the switch.

SHUNT METHOD,—WITH STREET CURRENT.

This method is capable of numerous variations, one of which is shown in Fig. 5. As will be seen, the fine rheostat is in shunt with the main line. It is not always necessary to have a rheostat in the main circuit. A resistance of two hundred ohms, if placed in this

FIG. 5.

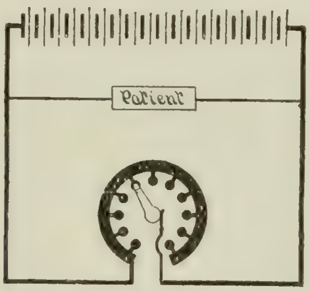


A and *B* represent the high- and low-tension street wires; *C*, a switch; *D*, a coarse rheostat; *E*, a shunt line with the fine rheostat in circuit. The patient is in shunt from the fine rheostat.

circuit beside a two hundred and forty ohm resistance, will do to take off fifty volts from. This allows a current of one-fourth ampère to pass through the main circuit. The patient should always be on shunt from the fine rheostat so as to be able to begin operation without shock. The potential of the shunt varies according to the current passing through the main circuit and the resistance of the circuit. The resistance is always constant, therefore the only way the pressure can be varied when the arm is not moved is by varying the current. This shows that if variations occur in the main line they will be transmitted to the shunt circuit, and through the patient, in exactly the same ratio as in the direct system, notwithstanding the claim of various firms to the contrary.

Fig. 6 shows another method. Here it will be seen that in order that the patient should receive little current, most of it must go through the rheostat. The amounts the patient and rheostat will receive will be inversely as their resistances. As in a battery it is necessary to economize in current, it is essential to put an additional resistance in the circuit to prevent the flow of too much current when the resistance of rheostat is at a minimum. This

FIG. 6.



resistance, theoretically, need only be used in starting, but as it cannot be suddenly thrown in or out without shocking the patient, it is necessary either to keep the resistance permanently in circuit or make it a second rheostat. If kept permanently in circuit it needs additional cells to overcome the resistance, and if a rheostat is used it adds unnecessary complication. This method then offers no advantage over the usual methods previously described and is neither so simple nor so efficient.

We have now seen that neither the direct nor the shunt method overcomes the fluctuations in the street current. These are large in some cities and small in others, but are never entirely absent. For this reason, as well as to eliminate the possible danger from lightning, it is well to use batteries.

The shunt method is preferable in all cases, for the reason that it divides up the whole pressure. Especially is it valuable if the street current be used, as in that case enormous resistances are not needed. Another advantage this method possesses is that the total resistance of the rheostat is not material, except in that if too small more current is wasted. As the dentist's spare space near the chair and within reach is always limited, the battery should be as small as possible. It would seem quite feasible to make a compact instrument that would regulate the current as the conditions in dentistry require, and which would control the current entirely by the movement of one arm. This arm should turn

the current on and off as well as regulate the strength. With a good form of cell the voltage is fairly constant, even for years. It is therefore possible with such a battery when using the shunt method to have the arm indicate the exact voltage the patient is subject to.

REMOVABLE PORCELAIN CROWN- AND BRIDGE-WORK.[1]

BY ADAM FLICKINGER, D.D.S., ST. LOUIS, MO.

From the earliest history to the present day the dental profession has recognized the fact that artificial teeth, mounted on base plates, of whatsoever kind, have not fully met the approbation of all concerned. While gold, platinum, silver, rubber, celluloid, tin, aluminum, and other metals and compositions have been and are still in use and have their merits, the profession acknowledges, in spite of science and skill, that prosthetic dentistry has made but little progress in the method of constructing a better, more comfortable denture, and one more in harmony with the original conditions of the oral cavity.

In crown- and bridge-work we have the ideal mechanism with which to restore the lost or sacrificed members, without adding a surplus of material, or covering such portions of living tissue which by nature were not destined to be encased and buried forever. This class of work has demanded the attention of the profession for many years, and many methods and appliances have been suggested and advocated from time to time by some of the most able men following our vocation. Among them we find Drs. Webb, H. C. Register, Finley Thompson, J. N. Williams, R. Walter Starr, James B. Hodgkin, G. W. Mellote, Wilbur F. Litch, W. Storer How, E. Parmley Brown, Bonwill, Sidney Stowell, C. M. Richmond, James W. Low, J. L. Davenport, George Evans, W. N. Morrison, and J. R. Callahan.

Dr. Webb's method, described in a paper entitled "Grafting Crowns in Lieu of Plates," which was read before an eastern dental society a quarter of a century ago and brought forth so much discussion at the time, has been almost forgotten.

Dr. Bing's method of bridge-work (retained by fillings), patented, if I am not mistaken, received considerable attention, and of recent

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[1] Read before the New York Institute of Stomatology, February, 1897.

date, Dr. Condit's method of "removable bridge plates" is advocated by some, and illustrated in different dental periodicals to a great extent.

Still, after all that has been written and published heretofore, the principle of bridge-work may yet be considered in its infancy; and the profession has apparently made but little progress towards the adoption of any one method which meets the general approval and satisfactorily solves the problem.

Cheap dentistry is, no doubt, one of the causes of the lethargy observed in dental prosthetics, for it must be admitted by all who study the subject that vulcanite, more than any other class of manipulatory work, has been the means of lowering the standard of prosthesis. The ease with which a vulcanite plate can be constructed, the little skill required in learning to flask, vulcanize, and finish a rubber set of teeth (aside from taking the impression and arranging the articulation), has opened an attractive field for a class of practitioners whose sole aim on entering the "business," as they term it, is to make an easy living, by doing cheap work and much of it; in this way they come into competition with the more learned and skilful, who in turn are obliged to let prosthetic work go and turn their attention and knowledge towards operative and medicinal dentistry. Vulcanite work, as one prominent St. Louis dentist said, "is a boon to the poor people," but, unfortunately, it has created a demand for cheap dentistry even among people who can well afford to pay for a higher grade of work.

If hearers and readers will observe the illustrations, and follow the description of a system of removable porcelain crown- and bridge-work herewith presented, they will find that it possesses many advantages over other methods of bridge-work and artificial dentures in general use, avoiding the mutilation of teeth and an undue display of metal.

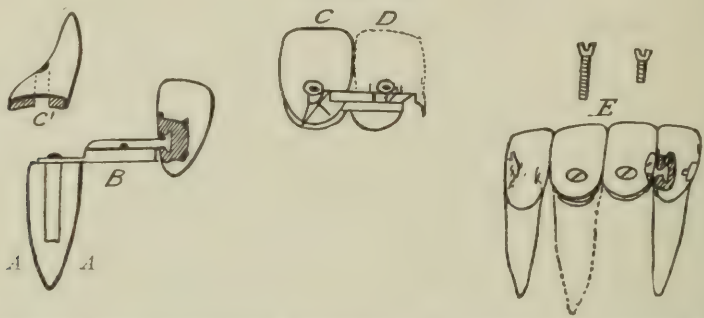
Being constructed of a heavy iridio-platinum saddle, onto which the teeth are soldered and baked, the whole fits snugly over a heavy bar of the same metal, resting firmly on the gum, and is anchored to natural teeth, roots or crowns, assuring perfect security against absorption of fluids and lodgement of food. The metal used does not invite or cause inflammatory conditions so frequently met with under bridge-work constructed of gold; at the same time its tenacity insures proper strength.

The model of Case V., exhibited to-night, shows five anterior teeth. It was illustrated and described in the May number of the *Dental Review*, 1896, and is a duplicate of a case made over four

years ago for a young man who had the misfortune to lose his teeth in a runaway accident, in which his nasal, malar, and maxillary bones and several teeth were badly fractured. Considerable surgical treatment was required before the construction of this bridge-work, which latter has given entire satisfaction so far, with every indication that it will continue to do so for years to come.

The illustration, Case IX., showing a single, removable crown and its various extensions, is an interesting study, and is copied from practical cases.

Case IX.



Case IX. shows a single crown and extension. *C'*, crown; *A*, *A*, root and pier; *B*, bar in position; *C*, *D*, teeth soldered on saddle; *E*, finished.

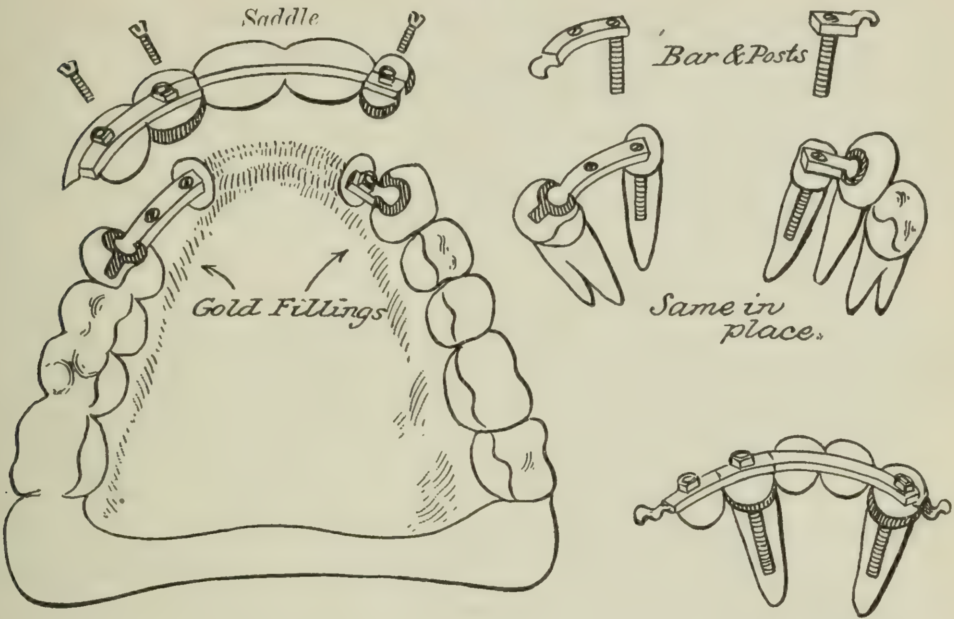
Case XIII. shows illustrations, models, and photos. of a case with combination anchorages. Examination of plaster model will show that the upper incisors project considerably beyond the lower teeth, with the right canine inside of the arch. The teeth, being badly decayed and containing dead pulps, did not, in my estimation, justify treatment, regulation, and subsequent filling; therefore I concluded to extract the two centrals and right canine. The lateral roots were utilized to assist in carrying the bridge-work. By comparing models may be seen the change brought forth by a temporary plate replacing the extracted teeth, made to allow time for shrinkage of the gum and for moving the lateral roots mesially and inwardly, thereby reducing the enormous space the centrals had previously occupied, at the same time gaining room for the canine.

The sketches of this work, Case XIII., illustrate the principle of binding the pier to an abutment. On the left the lateral root is bound to the canine, on the right the lateral root to the bicuspid by a girder-bar stretching across the canine space. Both bars are retained by ferruled posts in the roots and gold fillings in the teeth.

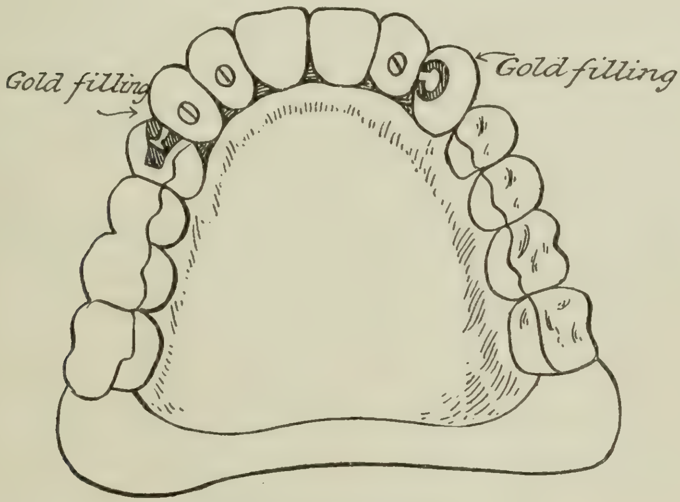
It will be noticed that my system differs materially from Dr. E. Parmley Brown's, inasmuch as his girder-bar and porcelains are all connected, while my porcelains are easily removed individually from the bar, allowing replacement in case of accident.

In conclusion, allow me to thank you for the interest shown in this system of removable porcelain crown- and bridge-work.

CASE XIII.



Admitting that I do not consider this or any other form, system, or method of bridge-work a cure for all toothless people, I claim



Case complete.

that if it be carried out with due regard to the fundamental requirements,—namely, good anchorage, piers, abutments, etc.,—it is a blessing to many patients, and a memorial to the operator more

lasting than the golden monuments carried about in the mouths of many of our fellow-beings, advertising the fact that prosthetic dentistry has rather retrogressed in comparison with other branches and studies in dentistry.

We should bear in mind, as Bacon says, that our studies should be neither "a couch on which to rest; nor a cloister in which to promenade alone; nor a tower from which to look down on others; nor a fortress whence we may resist them; nor a workshop for gain and merchandise; but a rich armory and treasury for the glory of the Creator and the ennoblement of life."

"NOT FAILURE, BUT LOW AIM IS CRIME."[1]

—LOWELL.

BY J. G. W. WERNER, D.M.D., BOSTON, MASS.

WHEN at the close of our last meeting a member of the Executive Committee asked me if I would give a paper, or a talk, this evening, I replied, "No;" but, upon reconsideration, I could not see why I, who had so often been benefited by the words of others, should not contribute my mite as an active Fellow of the Academy.

If in originality and intrinsic value the few rambling remarks that I shall present fall short, I must ask your kind forbearance. My aim will be to bring out discussion on some of the practical every-day points of our profession, the consideration of which may be of mutual benefit.

What are some of the most essential qualities of a successful dental practitioner?

First, as stated in my prefix, a quotation from Lowell, all of us should *aim high*, for a low aim in our profession is more criminal than an *honest failure.* Conscientiousness should predominate, direct, and guide us in all our work.

Second, moral purity and integrity of character are necessary if we would win the confidence of our patients. At this critical period of psychological study and research, when from infancy and childhood we are subjected to such searching scrutiny, is it any wonder that we human beings become so sensitive that a moral

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[1] Read before the American Academy of Dental Science, Boston, December 2, 1896.

taint of any kind is quickly felt or detected at a glance, and an instantaneous aversion or repugnance is the consequence?

Who has not experienced this feeling on coming in contact with certain persons, though they be comparative strangers, and the meeting only casual? How much more keenly must such repugnance or aversion be intensified in the close personal relation that necessarily exists between the operator and his patient, if he is not morally pure.

Then, as, so often and so aptly quoted, "cleanliness is next to godliness," the most scrupulous care and attention must be given to personal neatness in every detail, especially in regard to the hands, nails, and breath.

A simple lotion of rose-water, glycerin, and alcohol is an agreeable application to use each time after washing the hands. The operating-coat should be suitable in texture and color and always neat and clean.

In the office and the operating-room an atmosphere of immaculate neatness and thorough ventilation should prevail. It is indispensable that no odor of medicaments be detected either in the apartments or about the person of the operator. Nothing but the cleanest napery and the most thoroughly cleansed, sterilized, and polished instruments should be used, especial care always being given to the mouth-mirror. The most careful dentists insist upon individual mouth-mirrors.

As few as possible of the necessary instruments and appliances should be exposed to view, thus avoiding undue suggestion of the operation to the patient. With the constant multiplicity of equipments there is also a danger of the operating-room having the appearance of a machine-shop.

One of the most helpful and essential factors of a well-appointed office and operating-room—one that greatly facilitates the operations; that attends to the appointments and cares for the instruments, and who gives tone to the whole place—is the neat, refined, and well-trained lady assistant. In my estimation, she is an indispensable adjunct in our work.

The third essential is professional skill and ability. Nothing is of greater value and importance to the operator in this direction than the acquiring and possession of a gentle yet firm and sure touch. For what can weary and excite a patient more than the uncertain or unskilled handling of sharp instruments, where a sudden slip might lacerate the pulp or inflict a wound upon the surrounding tissues?

The awkward, noisy, or unskilful manipulation of the instruments, either by the operator or his assistant, is also a great annoyance, and produces an undesirable effect in the mind of the patient.

Much valuable time may be wasted by an unsystematic arrangement of the necessary instruments for daily use,—or from an unfamiliarity with and an unskilled use of the same,—and also by an indecision in quickly selecting the one best suited for a particular case. A good rule is to have a few carefully selected instruments, and to learn to use them well.

Fourth, tact, in my opinion, is an important factor in meeting our patients, and in successfully allaying any fear or apprehension that naturally arises in the mind of the one who is about to undergo either a surgical operation or a medical treatment. A quiet, reassuring demeanor, and a few kindly sympathetic words help greatly to accomplish this object; while nervous movements, brusque manners, harsh or careless expressions tend—especially with women and children—to create distrust and antagonism, and will repel the patient.

Another important but delicate point to emphasize is the need of our patients to understand the necessity of constant care of the mouth. A thorough brushing and massaging of the gums as well as the teeth several times daily, and an occasional scraping of the tongue are invaluable. A neglect of such care, I believe, is at the foundation of the so prevalent pyorrhœa alveolaris.

Every operator in treating decay in approximate surfaces should endeavor to fully restore contour, thereby greatly promoting the comfort of his patient and the general healthfulness of the mouth.

For the normal arrangement of the teeth is a continuous, uninterrupted grinding surface, and spaces between approximate surfaces are unclean, annoying, and detrimental.

I might suggest other subjects for our consideration, such as the treatment of root-canals, the importance and various methods of separating the teeth before operating upon them, the preference for certain filling-materials under certain conditions, etc., all of which, when rightly understood and conscientiously practised, would help us to attain that success at which we all aim; but I will speak of only one more,—namely, the great importance of good health to the operator.

Sir Benjamin Richardson, M.D., of England, thinks that the normal period of human life is about one hundred and ten years, and

that seven out of ten people could live that long if they lived in the right way. They should cultivate a spirit of serene cheerfulness under all circumstances, and should learn to like physical exercise in a scientific way. "No man, he says, need be particularly abstemious in regard to any article of food, for the secret of long life does not lie there. A happy disposition, plenty of sleep, a temperate gratification of all the natural appetites, and the right kind of physical exercise will insure longevity to most people." Unfortunately for his excellent theory, this celebrated physician and author of hygienic works died from apoplexy at the age of only sixty-eight years.

Practising dentistry, like most in-door occupations, has its detrimental effects; it tends towards short life instead of longevity; and it becomes our duty to counteract the injurious effects that our calling produces. In a general way, we may say that dentists look pale; have a tendency towards nervousness; are more or less dyspeptic; have an enfeebled circulation, heart-action, and respiratory function; acquire a contracted chest, and are short-breathed.

When we take into consideration our contracted position at the chair; the inhaling into our lungs, more or less, of the exhalations from the patient, such exhalations containing one of the most poisonous known alkaloids or ptomaines in existence; as well as the general nervous, strained condition that we are in while doing minute, delicate work, and all the time trying not to hurt; or, if we do inflict pain, to have a sympathetic perception of the same; it is not strange that all these should produce an enfeebled condition of health. When we ponder this fact, we must see at a glance the desirability, yes, necessity, of taking regular out-of-door exercise.

For years I have made it a point to work in a gymnasium; to keep an erect posture; to expand the chest by practising deep and full respiration; and have endeavored to be out-of-doors at least two hours out of the twenty-four, either walking, riding horseback, or bicycling.

From years of personal experience I know the great benefit and tonic effect of regular daily cold water bathing. Nothing rests me more than to get into a profuse perspiration from physical exercise and to take a quick cold bath afterwards.

If we wish to keep in good health we must eliminate from the system the used-up, broken-down, and effete matter; and we must not forget that through the skin, with its miles of eliminating and

perspiratory ducts, is one of the best ways to accomplish this object.

As professional men, we cannot place too high an estimate upon the great importance of unimpaired health. Good health so often means pure morals, cheerfulness, helpfulness, wholesomeness in every direction. Though I have spoken of good health last, I believe it is of almost the first importance, and in recapitulation, I might say that some of the important essentials of a successful practitioner are first, health; second, tact; third, professional skill, conscientiousness, and ability; fourth, integrity and moral and personal purity; and fifth, a high aim.

CONSOLIDATION OF THE TWO ASSOCIATIONS.

BY DR. B. H. CATCHING, ATLANTA, GA.

Editorials, correspondence, and observation have, for some time, indicated a necessary change in the national dental organization of the United States. It has not required the closest observation to see that neither the American nor the Southern Dental Association is measuring up to the standard required by the advanced position of the dental profession. They have served a good purpose, and are now ready to give way to an organization which shall unite the profession as a whole, and render results commensurate with the calling of which it should be the representative.

There should be no obstacle thrown in the way of such an organization. While some may have feelings of strong attachment to the existing associations, yet they should lay sentiment aside for professional advancement. The men who have been in the forefront of professional life and progress will almost to a man join in this move.

From a sectional stand-point there may have once existed a reason for the two separate organizations. That reason no longer has force in the minds of those who think above sectionalism. The spirit dominating the mind of the sectionalist is not the spirit of progression, but of retrogression. There are enough men in the dental profession whose minds are sufficiently cultivated and enlarged to form an organization which shall represent advanced thought and progress of the age.

This is not the time to set forth plans for such an association,

but it is not out of place to commence the plan as proposed by Dr. Harlan, who, as president of the American Dental Association in 1891, made the suggestion of dividing the country into quarter sections,—namely, northeastern, southeastern, northwestern, and southwestern, each division to have an organization to be known by the name of its respective territory; each division to meet annually, working under the same rules. From the four divisions or sections organize a national association to meet quadrennially at a given point, at which place would be a museum, library, and apparatus for research.

This seems to be an admirable suggestion, one not only feasible but practicable. This country is too large to be well represented annually in one organization. Distances are too great. As it stands, one-half the country is virtually denied the privilege of a national gathering. The quarterly division of the country, with an organization in each, would give that location which has been denied the benefit of organization, save State associations, vast advantages. Neither the American nor the Southern Dental Association can hold successful meetings west of the Mississippi River. Neither can the American have a large meeting if held in the South, especially if the time is in the summer months.

Every section of the country would be benefited by such a division of territory. Each section would vie with the other in good work. There would be a stimulus given to dental meetings that is badly needed; such a stimulus would bring forth work deserving a high calling, and lift association work out of the ruts in which it has been running for many years. Everything can be said in favor of this plan and nothing can be said against it.

Abstracts and Translations.

THE DISCOLORATION OF COPPER AMALGAM.

BY KENNETH W. GOADBY.

Some time since, in anticipation of the paper just read, Mr. Badcock enlisted my help to determine if possible something definite as regards the discoloration copper amalgam undergoes in the mouth. Unfortunately the time at my disposal has been

limited, so that the following results are rather fragmentary and incomplete. The points I have endeavored to solve are the chemical nature of the black and green discoloration, with the effect the latter conditions may have upon micro-organisms.

The literature of copper amalgam is most extensive and not a little contradictory, while no direct experiments seem to have been made with the well-known green-staining, although several observers have hazarded a guess. Other observers have made experiments as to its antiseptic properties, notably Miller, who placed pellets of copper amalgam upon plate-cultures, and found that the growth of colonies in their vicinity was inhibited, but at the same time unannealed soft gold had a similar effect. Now even if we allow that the copper does produce an antiseptic effect, it must be by the change of the metallic copper to some copper salt, but we cannot ascribe a like process to the gold cylinders. Under these circumstances it was thought desirable to confirm Miller's results. Plates of agar and gelatin were poured and small pellets of amalgam dropped on. In all the gelatin plates, five in number, a development of bacteria took place right up to the filling-material, which after a few days commenced to turn green. In three gelatin slant tubes a like effect was produced, the amalgam having no antiseptic action whatever. With the agar plates the series of events was even more interesting. Plates prepared in the above way after two or three days showed a distinct growth, the colonies sometimes stretching up to the mass of amalgam, and at other times some little distance away, making a well-marked zone; so far Miller is right. But the amalgam in all cases turned green and showed a ring of growth in its immediate vicinity; control tubes inoculated from this green zone developed rapidly upon agar, broth, or gelatin, while on agar and gelatin plates not inoculated with cultivations, no change whatever occurred in the amalgam, so I am able to point to conclusive evidence that the antiseptic effect of copper amalgam is an insignificant quantity. The explanation of the zone formed round the amalgam in which few or no colonies are to be seen is not difficult to explain when we consider the conditions. The medium agar is a damp one, and when a mass of material is placed upon its surface, the force of capillarity comes into play, a meniscus is formed, and the bacteria washed into it by the currents set up. Upon gelatin, which is a drier medium, this does not take place. The explanation appears to me to be perfectly in accordance with the facts, especially as colonies do eventually develop in the zone if inoculated when the agar has dried, while at

times colonies may be seen below the surface also. Clearly, then, we cannot say that the amalgam exercises any antispetic effect upon plate cultures; but is its action upon fluid media of an antiseptic nature? The following experiments were made to determine this point:

A series of tubes of broth, saliva, and gelatin were inoculated with (1) cultures from the mouth direct; (2) streptococci (brevis); (3) impure cultures from the mouth. In all cases a development of bacteria took place. Thus, one to three pellets per ten cubic centimetres did not prevent the growth in any case, the gelatin tubes developing similarly in the broth and saliva under the same conditions; the controls grew perhaps a little more rapidly, but the difference was so small that we cannot attribute even very slight antiseptic effect to the amalgam under discussion.

Miller's experiments with copper sulphate are conclusive as far as they go, but as will be subsequently seen, experiment renders the presence of a sulphate improbable, consequently the antiseptic reactions of copper sulphate do not form an altogether satisfactory argument in dealing with amalgams containing copper.

The discoloration of Sullivan and allied fillings is too well known to require any explanatory remarks, while the division of the coloration into "black" and "green" varieties is a matter of clinical experience which requires no further comment, we may therefore at once discuss the production of the former. Several tubes of saliva were taken and small pellets of amalgam dropped in; a solution of sulphuretted hydrogen was next added, and the tubes placed in a chamber at the body temperature. Within a short space of time the familiar sooty appearance was to be seen, while in those tubes in which the solution was weakest a chocolate-brown color occurred exactly resembling a condition often noticed in the mouth. Upon gently rubbing the black deposit a shiny surface was exposed, due no doubt to the mercury set free. On again placing the mass in the solution, the surface became once more coated with the black sooty layer, placing beyond a doubt the question of sulphide. This is of course what was to be expected, the experiments simply giving direct evidence of a self-evident fact. In the control tubes the material remained quite bright, while in several cases in tubes inoculated with an extremely fetid culture of mouth bacilli the amalgam turned black, the culture having the extremely unpleasant smell of a dirty mouth. In tubes inoculated with pure cultures of the mouth streptococcus, this result was not forthcoming. De-

composition of food is a fruitful source of sulphuretted hydrogen, so that the series of events in the buccal cavity is evident, and although the percentage of sulphuretted hydrogen present at any given time would necessarily be small, the process would not thereby be suspended but only prolonged, the movements of the tongue and the rub of opposing teeth during mastication accelerating the process by exposing fresh surfaces to the denuding action; in fine, the condition may almost be compared to the gradual wearing away of rocks by the combined action of carbolic acid and rain.

I have made careful examination of the sooty deposit obtained in this way, and although copper sulphide is always present no reaction characteristic of mercury was to be obtained; it is not improbable that the mercury recombines with the more electro-negative metal copper, eventually producing the curious pasty conditions sometimes met with. This hypothesis I cannot confirm by experiment, however, as in all cases a shiny condition was the only result. But the process just described is not the only method by which an amalgam may be disintegrated, the mouth organisms themselves produce chemical changes in the amalgam by which it is softened, eroded, and destroyed. To this we will recur later.

The second species of stain, often quite a dark green, was also investigated. The pigmentation has popularly been ascribed to copper sulphate, why is not quite clear, as many other copper salts are green, and at the same time the origin of a sulphate is, to say the least, obscure. On the other hand, more cautious observers have darkly hinted copper salts, thus leaving the field quite open.

Copper carbonate—that salt causing the green coloration of any article exposed for long to the air—would have been a far better theory, and it is most probable that this salt at times does occur, especially as the saliva normally contains sixty cubic centimetres of carbonic acid per one hundred cubic centimetres (Waller). However, I have attempted the determination of this salt by tests carried out in the following way. Teeth showing a well-marked condition of green stain were selected, ground up, and treated,—

(1) By prolonged boiling with sodium carbonate.
(2) Prolonged soaking in cold water.
(3) Dissolving in dilute acids.
(4) Dry reactions.

In the acid solutions the gelatin peptones formed so masked the other precipitates that this method was abandoned. Moreover, the small quantities of material at my disposal very much hampered the experiments.

The reactions of the filtrate from 2—1 were the same, and gave the following results:

(1) With barium nitrate a faint white precipitate, soluble in nitric acid.

(2) Silver nitrate gave a fairly well-marked precipitate, soluble in ammonia.

(3) Ammonium molybdate gave a slight coloration.

(4) Ferric chloride gave a blood-red coloration, soluble in hydrochloric acid.

(5) Heated with alcohol and sulphuric acid, acetic ether was given off.

Dry reactions.

(1) Original tooth fused with sodium carbonate on charcoal, and moistened with sulphuric acid on a bright silver surface, gave no black stain.

(2) Original tooth heated in tube with sodium carbonate and arsenic trioxide gave vapors of cacodyle.

There seems, therefore, no reason for supposing the salt to be copper sulphate, while the acetate reactions were well marked.

The next step was to produce the green coloration artificially.

Saliva tubes were taken and copper amalgam added, the tubes then being inoculated with cultures taken from the mouth, and a trace of lactose or dextrin added. In almost all cases, after forty-eight hours, a greenish tint made its appearance and gradually deepened till at the end of three weeks the coloration was most marked, the solution being acid.

These cultures gave the same reactions as the filtrates above mentioned, lactic acid being, curiously enough, not present so far as the ferric carbolate test is reliable. After a period of a month or six weeks little of the amalgam was left, a somewhat significant fact.

I have not at present sufficient material to determine the exact nature of the acetate formed under the above conditions, but from many considerations it is extremely probable that it is of an amidic nature, especially as glycocollate of copper is a well-known salt, crystallizing in blue needles and obtained by dissolving copper in a solution of glycocoll or amido-acetic acid; and once or twice I have seen needle-shaped crystals from the blue mass formed at the bottom of my cultures. I do not, however, wish to advance this as more than collateral evidence to a suggestion, as it is probable that other compounds are also formed,—*e.g.*, peptonate or albumate of copper, but I do state, most emphatically, that *a priori* remarks of the formation of copper sulphate are misleading and unscientific,

and further, that its supposed antiseptic action depends, and must depend, upon the disintegration of a portion of the filling, a condition at once unsatisfactory and undesirable.

(A) Saliva and Sullivan inoculated with culture from mouth (mixed).	(1) Good growth after twenty-four hours. Green coloration after seventy-two hours. (2) Good growth after twenty-four hours. Green coloration after seventy-two hours. (3) Good growth after twenty-four hours. Green coloration after seventy-two hours. (4) Good growth after twenty-four hours. No color after three weeks. (5) Good growth after twenty-four hours. Blackened after three weeks. (6) Good growth after twenty-four hours. Blackened after three weeks.
(B) Broth and Sullivan inoculated with mouth culture (mixed).	(1) Good growth forty-eight hours. Amalgam blackened. Fetid. (2) Good growth forty-eight hours. Amalgam blackened. Fetid. (3) Good growth forty-eight hours. Amalgam blackened. Fetid. (4) Good growth forty-eight hours. Slight coloration two weeks. (5) Good growth forty-eight hours. Blackened. (6) Good growth forty-eight hours. Blackened.
(C) Gelatin (hot incubator). From saliva mouth culture (impure).	(1) Good growth forty-eight hours. No coloration. (2) Good growth forty-eight hours. (3) Good growth forty-eight hours. (4) Good growth forty-eight hours. Green coloration three weeks.
(D) Saliva and lactose and Sullivan inoculated from broth mouth culture (mixed).	(1) Good growth forty-eight hours. Green coloration at third day. (2) Good growth forty-eight hours. Green coloration at third day. (3) Good growth forty-eight hours. Green coloration at third day. (4) Good growth forty-eight hours. Green coloration at third day. (5) Good growth forty-eight hours. Green coloration at third day. (6) Good growth forty-eight hours. Green coloration at third day.

(E) Saliva and dextrin and Sullivan inoculated from mouth culture saliva (mixed).	(1) Good growth forty-eight hours. No coloration. (2) Good growth forty-eight hours. No coloration. (3) Good growth forty-eight hours. Green coloration three days.

A 1 and 2, B 4, C 4, D 1, 2, 3, 4, 5, 6, E 3 gave acetate reaction. N lactate.

(F) Gelatin plate inoculated with mouth culture (impure).	(1) Green tinge to Sullivan colonies developed close up. (2) Green tinge to Sullivan colonies developed close up.
Gelatin plate inoculated with streptococcus brevis (pure).	(1) Green tinge. No zone. (2) Green tinge. No zone. (3) Green tinge. No zone.
(G) Agar plate inoculated with mouth culture (impure).	(1) Green color well marked. Slight zone. (2) Green color well marked. Zone. (3) Green color well marked. Zone. (4) Green color well marked. Colonies in zone under surface.
(H) Agar plate inoculated with pure culture streptococcus brevis.	(1) Green color well marked. Zone. (2) Green color well marked. Zone. (3) Green color well marked. Zone. (4) Green color well marked. Zone.

Broth tubes inoculated from green coloration of above plates developed a good growth in twenty-four hours.—*Transactions of the Odontological Society of Great Britain.*

Reports of Society Meetings.

AMERICAN ACADEMY OF DENTAL SCIENCE.

The regular monthly meeting of the American Academy of Dental Science was held at Young's Hotel, Boston, December 2, 1896, at six o'clock. President Andrews in the chair.

Paper by Dr. J. G. W. Werner. Subject: "Not Failure, but Low Aim is Crime."—Lowell.

(For Dr. Werner's paper, see page 310.)

Following Dr. Werner's paper the society discussed the subject of "Crown- and- Bridge-Work."

Dr. Cooke.—There is one crown that I have used quite a little which gives the strength of the banded crown, and at the same time gives all the advantages, as regards appearance, of the porce-

lain crown, and that is made by using a combination of the band and the English tube tooth. It is made as follows:

Use a band as usual; cut it off at gum line; solder on a piece of 27 gauge clasp metal. Grind Ash tube crown to place. Mark place on cap where hole in crown comes; drill hole size of tube wire, pass wire through crown and into root as far as it will go. Cut wire a little longer than needed; remove cap and porcelain crown. With wire hold cap and porcelain in contact. With wire in position, press Melotte's moldine into root end of cap and around pin and over edge of band. Use small amount of moldine, press upon asbestos board, so it will stay upright while soldering. Remove porcelain crown and put Parr's flux and solder around pin and heat up at once and solder. The moldine will hold the parts firmly in place, and the work can be done in a few moments, no delay for heating. Put the crown and cap together and hold firmly in contact. Heat in flame and flow sulphur around post and between porcelain and band. Set on root as usual.

The question of removable or permanent bridges is one that we have not had a final answer to as yet,—in fact, I do not know that it has been fully settled what a bridge is. It seems to me there is quite a variety of opinions on that point. One man considers a bridge a fairly large plate attached to certain teeth and having a bearing on the gum as well as upon the teeth; while others claim that such an appliance cannot be called a bridge. They say that in a permanent bridge the pressure must come entirely on the teeth.

I have been running over in my mind a list of the bridges that I have put on for several years, and I do not know of one that has been a failure, and they have all been of the kind called permanent bridges. I have never put on a removable bridge, and therefore my criticism and opinion in regard to them may not be worth anything. My experience with permanent bridge-work has been very satisfactory; at the same time, my success may be due to the fact that I have not attempted too much. I do not believe in picking out four roots and attaching twelve or thirteen teeth to them,—I would not expect such a structure to stand. That would be a poorly-selected case and could not be used to determine the success or failure of permanent or removable bridge-work. Then the shape of the roots must be considered in this kind of work. For instance, pointed roots are not intended to stand the shock of mastication.

The following method is useful in fitting crowns on badly de-

cayed roots: Secure anchorage in the root by means of a screw-post, as, for instance, a How post, then build amalgam around it and restore the shape of the roots with amalgam. When hard, polish and fit the band as usual.

Dr. Barker.—Mr. President, if it is in order, I would like to say something about one feature of Dr. Werner's paper.

The President.—It is perfectly in order.

Dr. Barker.—And it is about that portion of the paper wherein he emphasizes the importance of a cheerful disposition, as though a cheerful disposition were something which might be had for the asking, as black hair, or a blonde or a brunette complexion. I have said for a great many years, and I believe you will agree with me when I say still, that the most important single factor in the life of any human being is disposition or inherited temperament. A cheerful disposition, or a morose disposition, or any kind of a disposition, is something which comes to us and which we cannot make. It comes to us by inheritance, and in absolutely no other way. When I make that statement very likely the minds of some of you jump to the old discussion which we have heard so much about, and which is still a favorite subject for debate, the question of free will and predestination; in other words, how much can we modify disposition once inherited? I believe in a certain way, and up to a certain extent, in free will; that is to say, I believe, as I suppose all of us believe, that we have the capacity to originate an impulse. If so, it may to that extent, perhaps, be said, we are all little gods. I pick up that apple; I will drop it or I will hold it, as I choose. No one can successfully deny, even if they go into a long and bewildering metaphysical discussion, that I did, in the exercise of free will, originate the impulse to drop the apple. To this extent, in this way, and in no other way, can a man modify his disposition. If I have inherited a disposition to look upon the dark side of things, I must struggle against it just as long as I live. It is like gravitation, always operating in the same direction, and you are forced to contend against it all the time. What parent is there here, who cannot tell pretty nearly what Mary will do under certain circumstances? He can predict almost to a nicety what Charlie will do in given emergencies, and in the case of either child almost never make a failure. But I need not enlarge. I simply arose to suggest that I do not think Dr. Werner realizes the extent of the task he marks out for some people when he asks them to cultivate a cheerful disposition. A disposition is something which you get from your mother, or

your father, or your grandmother, and although we may seem to cultivate it out of us, or to cultivate something into us, and we succeed in individual cases, through the principle of originated impulse, a case of atavism occurs, we revert to the original type, our true disposition shows itself, and we never really get rid of it. So when you speak of changing this, or changing that, you must begin at the right place to reform, and the reforming of a disposition, gentlemen, must begin with your grandmothers and your grandfathers; you must change dispositions in just precisely the same way that I have adopted in changing the plumage of my pigeons, by mating the proper colors; but, as a matter of fact, when John and Mary fancy each other, they do not take into consideration what kind of plumage the birds are going to have. That is what we must do, if the human race is ever to be perfected,—there must be more judgment exercised in mating.

Dr. Werner.—I do not disagree with Dr. Barker as regards the effect of heredity on disposition, but we can improve some of our inheritances. The human race, in all probability, did not begin with Adam; science teaches us the ascent of man. We have done very well so far, and we can do better yet. The training of a disposition is just as essential, and should be as much a branch of education as is the teaching of A, B, C, arithmetic, or any other study.

President Andrews.—I will now ask Dr. Wilson to give his views with regard to crown- and bridge-work.

Dr. Wilson.—About two years ago I read a paper before the Academy on this subject, and as nothing has transpired since that time to change my views, anything I may say this evening will be somewhat in the line of repetition.

There is no one subject which has called forth such a diversity of opinion on the expression of such extreme views. It seems to me we are inclined to take extreme views in matters pertaining to our profession, and, at times, to be somewhat inconsistent. For instance, one man says, "A skilfully constructed and properly adapted bridge is one of the most elegant and cleanly operations in dentistry," while another says, "As a practical fact, permanent bridges are simply the nastiest things ever made to do duty as substitutes for nature's work."

Now, we have all seen bridge-work in the mouths of patients which could exemplify the truth or falsity of either of those statements. For instance, we have patients who are dainty, fastidious, and scrupulously clean, both in their person and appearance. We

also have patients of naturally cleanly habits, who have the will and inclination, but lack the faculty of keeping their mouths clean. We also have a third class who are indifferent and do not attempt to clean their mouths. I have patients of refinement and education, in the fashionable walks of society, whose outward attire is in the height of fashion and neatness, who never remove their artificial teeth.

Now, it stands to reason that bridge-work in the mouths of the first class of patients I have referred to—viz., those of dainty and cleanly habits—will present a very different appearance from bridge-work worn in the third class, whose mouths are habitually in a filthy condition. Therefore the matter of cleanliness has largely, if not wholly, to do with the patients. Dr. Bonwill very truly says, "A bridge cannot be kept any cleaner than a plate that is removable, and I never saw one of the latter that did not have to be polished out of the mouth."

In my opinion permanent bridge-work, except small pieces, cannot, as a rule, be kept in a cleanly and wholesome condition, and is one argument against its use. With all our advanced knowledge in the care of devitalized teeth it must be admitted that occasionally we come across "dead teeth" that are not wholly amenable to treatment, and remain in a semi-inflamed and sensitive condition. There are also many cases where dead teeth, which if left alone would remain in a good and healthy condition, would, if subjected to the weight and pressure of bridge-work, become sore, painful, and useless, and the only remedy would be the removal of the work, which might have been put in only the week before.

The foundation upon which the bridge rests, and is retained in the mouth, like the weak foundation of a house, is an element of uncertainity and more or less doubt, and is another reason or argument against the use of permanent bridge-work. Porcelain teeth are always liable to fracture. It is almost always possible to bore a couple of holes in the backing and cement a new tooth in the place of the broken one. This can be done with safety and certainty if the conditions are favorable.

There are, however, very many cases where, owing to narrow spaces and peculiar occlusion, with perhaps very thin backing, it is necessary to use small and weak teeth, liable to fracture at any time. The repair of such weak teeth in the mouth is a temporary expedient at best, and therefore necessitates the removal of the bridge from the mouth to properly repair it.

Nothing can be more trying to a busy man, with his book full

of appointments, than to be obliged to repair a broken bridge for a patient who is going away immediately.

I have not as yet been in this predicament, but always realize the possibility of such happenings, and rather than run the risk of being caught in that way I prefer to send those who wish bridge-work somewhere else.

I have in mind the case of a lady who came to me a few days ago. I put in her mouth a bridge consisting of a dummy second bicuspid, attached to a first bicuspid, Richmond crown. The second bicuspid had been lost in very early life; the space had closed up very considerably, necessitating the use of a very small and weak piece of porcelain. While the lady was in Europe, fortunately for me, the porcelain was broken off. It was repaired, very nicely too, by some dentist abroad, who punched a couple of holes in the backing and cemented the tooth in place, and it has remained in that condition for about a year, but still it is liable to break down almost any time. If it had broken while she was here in Boston I would not have felt justified in repairing it in that way. There is always something happening to such cases. While I am perfectly sure there are a large number of people wearing bridges which meet all the requirements as regards cleanliness, looks, and durability, yet, for the reasons that I have given, I have not made bridge-work for a good many years. I do not think there is any one reason that I can advance which, more than any other, has led me to abandon this work, unless it is because of the element of uncertainty about it. While I have no prejudice against bridge-work when it is properly constructed,—I think it is a good thing,—yet personally, I limit myself to small pieces.

President Andrews.—I repaired a case in the way described by Dr. Wilson four or five months ago. One of the porcelain facings in a crown broke off, and I drilled a couple of holes through the gold backing and into the gold crown, and after carefully grinding a tooth with long pins to fit, I cemented it in with Harvard cement, and it is doing good service.

Dr. Draper.—I would say that my belief is a good deal as Dr. Wilson has stated his. I do not believe in large bridges, and I do think that in small cases where the patient will take great care of them, they are very successful. I remember that quite early in the practice of bridge-work I saw a case that came from "head-quarters,"—where bridge-work is supposed to have originated,—and this case was an upper and a lower denture, supported on four teeth in each jaw. At the time I saw it the upper bridge was all right,

but the lower one had given way at the foundations so much that what was supposed to be a fixed bridge had, in little less than a year, become a removable bridge. The patient could take it out roots and all and put it back again at will, and consequently I replaced it by a plate.

I was once a little unfortunate myself in that kind of a case. I made a bridge which extended from a wisdom-tooth to a cuspid; all the intervening teeth were gone. I put a gold crown on the wisdom-tooth, placed in four dummies,—two molars and two bicuspids,—and anchored the anterior end into the devitalized cuspid by a pin cemented into the canal. That was several years ago, and I think on an average I see that case about once in six months. The anterior end has loosened a little and needs to be reset. I think that too long a space is the trouble with a great many of the fixed bridges,—if the supporting teeth do not loosen from the strain they have to bear, either the filling or something else will give. In regard to repairing bridges, I have been very successful in using the Bryant method of securing plate teeth to the backing. After smoothing the backing where the tooth has been broken off, I select the facing to go on, putting a little rouge on the ends of the pins to mark where they are to go, and drill through the backing, making quite large holes and countersinking them on the inner surface. I then cut a thread on the pins of the tooth, select nuts to fit, and cement the tooth in place; screw the little nuts into the countersunk holes, cut off the pins, and polish to the surface of the backing.

What I had to say particularly this evening was with reference to bridge-work without crowns. I have been troubled, as I suppose all of you have in cases where, by the loss of some of the bicuspids or molars on either side of the lower jaw, the anterior teeth wear away the upper incisors on their palatal surfaces, and many times we find the pulps of the upper incisors being encroached on by wear. It was in such cases that I have adopted a method which has given me a great deal of satisfaction. I have not seen it practised by any one else, and will try to illustrate it as well as I can. The bicuspids and molars are built up sufficiently to open the bite by pieces of pure gold burnished on to the grinding surfaces, with two or three pins fitting into holes drilled into the teeth, and the occlusion made correct by pieces of plate and solder melted on. Dummy crowns are then fitted between the teeth which have been tipped and soldered to the tips, making a continuous bridge. The tips are then set with cement. The palatal

surfaces of the incisors may then be restored. There is another method of bridging without crowns that I have used for the lower incisors, where there are perhaps one or two centrals or laterals missing, and the other teeth are loosened through Riggs's disease or by the presence of tartar. After cleaning the teeth thoroughly I have used the method (I do not remember who is the inventor of it, only that I read it in the *Dental Cosmos*) of fastening all of the incisors by burnishing pure gold against the lingual surfaces of these teeth, and then drilling above the pulp little holes about the size of an ordinary tooth-pin right through the tooth against the pure gold backing. Having the holes all parallel, drill through the teeth and the backing too; then insert little gold screws that go right through the teeth and fasten into the backing with solder gold; then strengthen the whole bridge by running a platinized gold wire along the back and flowing solder over it. If any tooth is missing a facing may be soldered to this backing. The bar and screws should then be placed in position with cement between them and the teeth. Next put the nuts on the outside and screw them up until the bar on the lingual surface is as tight as required. The nuts are removed after the cement has hardened, and the ends of the screws can be polished off so that they look like small fillings. The patient is only too glad to have the teeth saved, and does not object to this small disfigurement. I have here two or three specimens that show the inaccuracy that is sometimes used in fitting crowns that are put on, but do not touch the necks of the teeth either because of the teeth being not sufficiently trimmed, or from some other cause,—lack of skill, possibly. Here is one in particular that does not resemble a tooth any more than it does a percussion gun-cap. Here is a bridge that is something like the one I described. This was attached to a molar and a cuspid, but the cuspid loosened in the socket, and, of course, the rest of the bridge was of no value. The span was too great and something had to give way.

Dr. Belyea.—I have had a different experience from Dr. Cooke, but I have not seen a case of bridge-work that was properly constructed that has failed. Wherever there has been a failure of my work, it has been because I did not know enough to do it properly. I think bridge-work is all right, though I will admit there is a great deal of room for improvement in the construction of it. I have here some few ideas which I have stolen from various people. The first one was given to me by my friend on the right, Dr. Cutter. He told me a little while ago of his method of securing

the measurement of a root and a pattern at the same time. He has a number of different-sized copper bands made extremely thin, and they match the various sizes of the S. S. White Dental Manufacturing Company's seamless collars. He fits the copper bands on the root to be crowned, and uses that for a pattern to cut his gold by. I took that idea and used it a little further. My first advance was to fit the band in the way he suggested, run it up as far as I could on the root, covering the end of the root with moldine, and getting from that a model that was almost a perfect representation of the root. Upon that I could fit a band or do anything I wished. I find it is a good deal more convenient to have a model to do the work on, so now in many cases I take these bands, fit them under the gum the required distance, take a plaster impression of the end of the root, remove the band, and then take a model of the root with fusible metal, and I have very nearly a perfect cast to work on.

Another person from whom I have taken the liberty of purloining some ideas is Dr. Hollingsworth. There is a method called the Hollingsworth method of making crowns. I think the best thing about it is the pamphlet. From that you get excellent ideas, and one of those ideas is to burn the band into a piece of wood. Another thing that I wanted to refer to is the making of cusps, the grinding surfaces of teeth. I have taken a little plan of my own for that. Take a couple of natural teeth and invest them in a section of brass tubing, a right and left, articulating surface protruding about one-eighth of an inch, take an impression of them in some modelling composition, and fill in with plaster. These cusps are susceptible to change,—you can do anything with them that you can with the Hollingsworth and more. After you have them in place on your model, you can articulate it, take the impression in moldine, and swage up your articulating surfaces.

Another way of using these teeth if you want to get a counter-die the same as the die-plate, only a good deal better, is to take a piece of brass bar rod, cut off the size you want, put it into the rubber ring, and pour in fusible metal while it is hot; after it has hardened you will get a counter-die which is absolutely perfect, and you can work on that eighteen- or twenty-carat gold without seriously marring your die.

Instead of making a plaster cup, another way is to take these dies as you have it shown there and swage one of shot. You can trim the lead so readily with a sharp knife that you can modify its shape almost as easily as you can plaster. The cause of most of the failures that I have had was the lack of stiffness of the

gold that I used for bands and crowns; and I owe something to Dr. Wilson for recommending here one evening a few years ago the use of eighteen-carat gold for such purposes; but I think I have improved on that by using in some cases clasp-metal, which also has the advantage of being inconspicuous. I think Dr. Piper knows something about this bridge-work which Dr. Draper has drawn on the board.

Dr. Piper.—I suppose Dr. Belyea refers to the bridge which Dr. Draper drew on the paper showing the ends fastened into the teeth by means of pins. He got up this bridge for me and made valuable suggestions in regard to its construction, which I followed. It has done good service. I put it on about two years ago, and when I saw it a few days ago it was in perfect condition. I have also used a method similar to that which Dr. Draper referred to for fastening loose teeth. The case which I had was fastened by means of pure gold pins going through the teeth. It consisted of two centrals which were so loose that it was necessary to ligate them in order to hold them in place while being worked upon. Drilling through just below the cutting edge of each tooth from cuspid to cuspid and then through a narrow band of gold swaged to fit the lingual surface of each tooth, I then, into this band, soldered twenty-four-carat gold pins, setting the whole in place with cement and riveting down the pins. After four years of wear this appliance was found to be doing good work.

Dr. Belyea.—I had hoped that Dr. Piper would mention, relative to the case of which he first spoke, something that he noted after the use of it for a time. In addition to putting on the bridge he had to build up the other teeth in order to open the bite and to save wear on the other teeth. I believe he was supplying three teeth on each side.

Dr. Piper.—The bicuspids and sixth-year molars.

Dr. Belyea.—And he noticed after it had been in wear a little while, about a year, that the old occlusion had been re-established. From that and other things which I have noticed, I have learned that you cannot depend on one or two, or even four teeth sustaining the bite. Where there is constant pressure on a few teeth, those teeth will shorten in their sockets to bring about a general occlusion, and so when I am putting on a bridge which is a trifle long and have not been able to get the occlusion correct for any reason, I do not hesitate to set it and assure the patient that it will soon settle into place. You will sometimes see that in bridges where the dummies are supposed not to come in contact with the

gum; after they have been in wear a little while you find that the gum hangs down over the dummies which were not made to touch.

Dr. Piper.—In regard to the case which Dr. Belyea just referred to, it is some four years ago that it first came to my notice. The patient was an elderly gentleman from New Hampshire, and at that time had worn the six anterior upper teeth nearly halfway down. After looking the case over I decided to open the bite by building down the front teeth with gold and putting in two bridges carrying the bicuspid on either side, attaching to the sixth-year molars by means of shallow caps and open-faced caps on cuspids; molar caps having four pins and cuspids, two running into the teeth about the gum line. Dr. Belyea suggested more than one pin, so I made them according to his ideas. For lack of time the front teeth were not built down, consequently he was obliged to do all his chewing on these two bridges, with the result of bringing the teeth into the same position, after four years of wear, as they were before the work was done.

Dr. C. T. Barker.—One thing I have not heard spoken of here to-night, and that is, placing on crowns without bands. In the majority of cases it is unnecessary to put on a band. I think I place on single teeth fewer and fewer bands every year. Patients do not like to have bands put on; in the first place, because the process is very uncomfortable, and, besides, the appearance of gold is objectionable, and I have found that a case is just as useful without the band. I never had one break.

Another thing is about setting the crown. I always used to set them with cement,—I think almost everybody does,—but lately I have set them with gutta-percha, and when for any reason it does become necessary to remove a crown it is very easy to do it, whereas if it is set with cement it cannot be done without destroying the tooth. It is a little more difficult to get accustomed to putting it on with gutta-percha, but in the end it is much more satisfactory.

Dr. Smith.—Will Dr. Barker please tell us how he would set with gutta-percha a bridge supplying, say, three teeth,—a molar and two bicuspids?

Dr. C. T. Barker.—When I spoke I referred to single crowns. Use the pink gutta-percha or base-plate, and have the tooth and gutta-percha both very warm. Of course, you have to be very careful to use the right amount of gutta-percha.

Dr. Wilson.—When you put it on, is the pin attached to the tooth, or do you place it in separately?

Dr. C. T. Barker.—With the pin attached. Soften the gutta-percha with cajuput oil and perhaps put the pin in cajuput oil. It will go into place if you have the right amount of gutta-percha, and being very warm and everything very dry, the gutta-percha will squeeze out and form a very thin covering over the end of the root.

Dr. Belyea.—I think I can enlighten Professor Smith on that matter. I set a great many of my bridges and nearly all of my single crowns with gutta-percha. I use Doherty's white base-plate gutta-percha; put that around the pin and around inside the band. This is forced into place while the root is yet moist so that it can be readily withdrawn and the surplus trimmed away. Then after preparing the root, dry it and clean it thoroughly, put in a little chloro-percha and set your crown in place. If you have a bridge you can set it equally well.

William H. Potter, D.M.D.,
Editor American Academy of Dental Science.

ACADEMY OF STOMATOLOGY.

A regular meeting was held by the Academy of Stomatology January 26, 1897, at its rooms 1731 Chestnut Street, the President, Dr. James Truman, presiding.

The Clinic Committee reported two clinics held the previous Saturday. One by Dr. H. E. Roberts upon novel and quickly-constructed orthodontic appliances; the other by Dr. M. H. Cryer, who exhibited a case for whom he had performed a surgical operation to facilitate the moving of a malposed cuspid tooth.

The council reported the following acknowledgment of a valuable gift of books to its library by the family of the late Professor J. E. Garretson:

The Academy of Stomatology extends to the family of the late Professor Garretson a vote of thanks for the valuable contribution of books, presented in the name of his grandson, Edmund Garretson Cooke.

The Academy of Stomatology has satisfaction in taking advantage of the opportunity to express its high appreciation of the character of Dr. Garretson and of his abundant, honorable, and advanced work in the field of oral surgery in which he was eminent.

The Academy has further pleasure in devoting the evening of January 26, 1897, to a review of the life work of Dr. Garretson.

(Signed) LOUIS JACK,
HENRY H. BURCHARD,
ROBERT HUEY,
S. H. GUILFORD,
M. H. CRYER,
Council.

The President.—The subject of the evening will be opened by an essay on "The Work of James Edmund Garretson, A.M., M.D., D.D.S.," by Dr. Burchard.

(For Dr. Burchard's essay, see page 151.)

The President.—Gentlemen, you have heard this able and appreciative essay on Dr. Garretson's life work. Remarks are now in order, and I will call upon Dr. Guilford to open the subject.

Dr. Guilford.—Mr. President and Fellow Members,—I had not conceived the idea of speaking upon the subject this evening, because I have already spoken and written on it. However, while listening to the paper of the evening a few remembrances recur to me, which illustrate the character of Dr. Garretson.

All who knew Dr. Garretson were impressed with certain qualities he possessed,—which were characteristics. In the first place, he was a sincere man,—absolutely, conscientiously sincere. In the second place, he was an earnest man. He never did anything in his life, I believe, but what he put his whole soul in it. No one who ever knew him doubted his sincerity. He never pretended to love a man, or to care for one, without really doing so. He never flattered any one; he often praised men, praised them to their faces, and he meant it. He was not lavish in his praise; in fact, on many occasions it was thought that he withheld praise where it was due, but when he did give it he meant it. He was so earnest that whatever he did he did with a certain degree of solemnity. He was fond of humanity. He appreciated a joke as much as any one, and yet at the same time in everything that he did there was an earnestness that impressed those about him. I suppose it was due to the fact that he was absorbed in his own contemplations. These qualities, earnestness and sincerity, commanded the respect of all who knew him.

He possessed a power to attract, not only those of his own age, but younger people, particularly young men. His influence over young men was remarkable, he influenced them because he loved

them, and they felt that he was always ready to listen to anything they might confide in him. They went to him for advice and they got it; they went to him for sympathy in their troubles and he gave it to them. If they needed more material aid he was always ready to assist them. He was a remarkably charitable man,—charitable in giving material help, as well as in other ways, and yet he knew the value of money. For many years he was a demonstrator in one of our colleges; after laboring there half a day he would wash his hands and go out and eat a ten cent lunch, and yet when he came to die he had been so prudent that he had accumulated a competence.

I remember a case of destitution in a little village where I lived that was particularly pathetic in its details; one that appealed to the sympathy of all those who knew of it, and there were very few who did. I wrote a few notes to some friends in regard to getting together a fund to assist the family. I wrote to Dr. Garretson and told him that I had requested a few of my friends to contribute five dollars apiece. He wrote back enclosing ten dollars and saying, "My dear Doctor,—Don't speak about $5.00. Let them give $10.00, and if more is needed call on me." Now, that showed the character of the man. It was this kindness of heart that attracted men to him. He not only appeared to but actually did sympathize with all who placed their confidence in him, and it was for this reason that he was beloved by so many people, particularly by the young people. I do not know that he had a single enemy. I never heard of one. I never heard a harsh or an unkind word said of him after his death; nothing but praise from every one, not so much because they appreciated his greatness in his own particular line, but because they appreciated his greatness of heart, one of his chief characteristics.

The President next called upon Dr. Cryer.

Dr. Cryer.—For eighteen years I followed that gentleman day after day and loved him as I loved no other man except my father and brother, and whenever I think of him and hear him mentioned it overcomes me and I cannot speak upon this subject.

The President called upon several gentlemen, who did not respond.

Dr. James Truman.—I should like to express briefly my feelings in regard to Dr. Garretson. I do not think the Society should pass this subject without more remarks upon a man who has done so much to elevate dentistry. We not only appreciate this part of his life work, but also that performed for surgery. He opened new lines of thought and spread abroad new ways of doing or perform-

ing surgical operations, which I think must have a lasting effect upon the medical and surgical practice. I do not know that they recognize it, but to my mind his contributions are a great force.

Dr. Garretson and myself were personal friends. We never met but it was a pleasant reunion. I enjoyed the conversation we had together on many subjects, philosophical and otherwise. I do not think as a man he was understood. I fear that when he came before the public as a speaker, his remarks were not fully comprehended. He talked generally in a language above that used by the common people, but when his thought could be absorbed and followed to legitimate conclusion, it exhibited a vital force not usual in public efforts.

I shall never forget, so long as life lasts, his address on the occasion of the Well's Memorial Meeting. It struck me as being one of the most forcible, as well as one of the most powerful, addresses that I had ever listened to, and yet I fear the majority of that audience did not fully appreciate it. There is something in becoming acquainted with a man's mode of speech in order to comprehend an address of this character. I sat under Dr. Garretson in his philosophical lectures during one entire course, therefore I became more familiar with his mode of thought, and probably better able on that account to reap the value of his ideas. He, to my mind, was one of the great men in dentistry, and we are here to-night not so much to mourn his loss as to remember him in his work.

INCIDENTS OF PRACTICE.

Dr. Jack.—I wish to present the report from the notes of the conservative treatment of a pulp which I believe to be the first attempt of the kind made by me. The date was in September of 1866. The surface of decay the occlusal. The condition one of evident exposure to the carious denture, the last layers of which were not removed. A concave cap made of a heavy mat of gold foil was filled with a paste composed of hypophosphite of lime and glycerin; this, being laid over the part, was next covered with a layer of gutta-percha. The cavity was then filled with amalgam.

On January 25, 1872, this case was opened. On removing the fillings and a thin layer of decayed dentine a distinct pulp opening was found which was unmistakable. The size of it was about the twentieth of an inch and was of circular form. On the examination of this aperture a solid obstruction was found at a short distance. This was sensitive, as ordinary dentine usually is. Pressure

was made on this point with considerable force upon wet cotton, which gave no pain, proving that the pulp had entirely obliterated the exposure. The sensibility of the adjacent dentine was normal.

I had previously and have since not infrequently observed the distinct step inward to the secondary dentine as was observed in this case.

To-day the same tooth presented with a pulp exposure from caries on a proximate surface at the cervix, which was capped in the usual manner I now pursue.

I bring the case before you as one evidence out of many in my experience where there has not been the least indication of pulp degeneration. It has not been uncommon for those distrusting conservative treatment of the pulp to maintain that progressive degeneracy of the pulp tissue is a necessary consequence following this mode of treatment. I may state here, it has been rare to find nodulation when subsequently the pulp has become devitalized. I am inclined to take this occasion to reiterate that, with correct precautions, pulp exposures previous to the occurrence of objective indications of pulp irritation is an entirely rational and generally successful method of treatment.

Question.—Will Dr. Jack give his experience relative to electric osmosis and what that experience continues to be?

Dr. Jack.—I have the satisfaction to state that the results continue favorable.

There is one important feature of the application of this means of giving relief from pain. This is in reference to the statement that the sensation produced by the current when the pain limit is reached is due to the evolution of heat in the tissue caused by the resistance of the dentine to the current.

In a number of instances I have made the test of applying five, ten, and fifteen chloride of silver dry cells. These are presumably of one volt each. In each case the pain limit is reached at the same degree of ampèrage. As current strength is the source of electrical energy this result is in agreement with electrical laws.

The pain limit appears with different persons at various degrees of ampèrage, according as the required resistance is varied; but more particularly for the reason that thermal irritation of dentine is a very variable condition. In other words, the temperature sense of the dentine differs in individuals.

The foregoing statements indicate that high voltage is not required, as only a certain degree of strength of current in milliampères will be tolerated. This can generally be forced into the

tissue by a very small voltage rate. If the initial voltage be comparatively high, the resistance must be so great as to reduce the actual voltage to a tolerable rate.

There is one other important consideration connected with the application of electricity in cataphoresis, which is that the resistance of the controller at the highest part should be so extreme that no impulse is given at the commencement of the administration. At present I have in use a Willms controller, having a resistance at first of over three hundred thousand ohms. With this there is no initial impulse when the circuit is closed. With the former controller, having a resistance stated to be of ninety thousand ohms, some persons would feel the first contact with five volts of current. This question of the impulse of current is well elucidated by Dr. Price in an article to appear in the February number of the *Dental Cosmos*. There is nothing more clear from my experience than the necessity for minimizing the electro-motive force at the commencement of the administration. The great value of this means of treatment is in some danger of being prejudiced by using high initial voltage with insufficient resistance. The apparent requirements are low initial voltage, probably ranging between five and twenty, with resistance commencing at two hundred thousand ohms or over. The purpose of this very high resistance being, as previously indicated, to avoid the initial impulse.

Dr. Roberts.—Dr. Jack's illustration simply proves that the voltage only is necessary to overcome the resistance of circuit; that the number of volts that we use does not make pain or lessen the pain. It is the amount of current or the ampèrage which passes through which does the work, and the voltage is only necessary to force the current through the resistance. If the five volts will produce the result, that is all that is necessary, or fifteen volts, if you have to use that ampèrage, there is no more pain when the same amount of current is going through it. It is not the voltage which gives pain, it is the ampèrage, in connection with the controller. I believe that a controller based upon the resistance and taken out is based upon the wrong principle. The voltage should be increased or decreased correctly and not the resistance, and that can be done.

Dr. Jack.—There is another point of importance not directly stated in this discussion,—that is, while some persons will indicate the pain limit being reached at a given point of the controller with an initial voltage of five cells, another person may not indicate the pain limit at the same point of the controller with an initial volt-

age of fifteen cells. In the one case the ampèrage will be less usually than three-twentieths milli, in the other three- or four-tenths milli.

Adjourned.

H. H. Burchard, M.D., D.D.S.,
Editor of the Academy of Stomatology.

Editorial.

THEN AND NOW.

Those whose experience in dentistry can antedate the last half of the century will remember the crudities in work at that time in many directions, but more especially in that of supplies. The assembling of articles needed in dental work under one roof was not then thought of any more than, if as much as, it is considered necessary to-day in general medicine and collateral surgical branches. The instrument-maker was then an important factor, and was supposed to be equal to the manufacturing of all necessary tools for excavating, filling, or extracting. The silversmith would prepare the solder and roll out the silver and gold when these could not be made in the laboratory. The aid of the machinist was often required for a special instrument, and even the teeth for artificial dentures, both before and after the advent of Stockton, were, in this country, carved and burned in private laboratories.

The change from this in fifty years has been so gradual that very few, it is imagined, ever stop in the busy whirl of every-day work to think of the marked difference between then and now.

From that period, beginning in the thirties, has been developed about all we know of modern dentistry in its several relations. The mind that fails to be impressed with this growth must be dull indeed and incapable of comprehending its significance in all its details.

It is feared that many in our profession have such an exalted idea of what is called its scientific side that they are incapable of observing with judicial accuracy that progress in any direction is not the result of one form of thought or practice, but must be attained through an aggregation of mind leading through diverse

channels to the same end; and cannot be accomplished through a narrow-minded or contracted experience.

It is not uncommon to hear expressions like this: "Dentistry is a profession, not a trade," as though it were necessary to exalt the one at the expense of the other. The "mere mechanic" is a glib phrase too often heard, and that with disgust, by those who recognize in the mechanic of originality the highest type of advanced thought. The writer always stands before a complicated piece of mechanism with a certain feeling of awe and veneration as though in the presence of the nearest representative on earth among men of the Divine creative thought of the universe.

The lines should unquestionably be sharply drawn between professional work and that styled mechanical or commercial, but he who is unwilling to give due meed of praise to both the latter, as equal factors in progress, is incapable of reading history correctly.

The condition of things, in dental work, at the period named have all changed. The old Stockton teeth, massed by thousands in tin boxes to be laboriously selected, have given place to artistic arrangements on cards, in which some regard is had to natural appearances. Instead of the dentist running round to this shop and the other mechanic for tools, he finds them assembled to his needs under one roof. Instead of patronizing the silversmith for his silver or gold, he has these ready prepared for him by metallurgical experts; and instead of depending on hand-made instruments, no two alike, he expects to receive the finest steel made into instruments by machines constructed with mathematical accuracy, and always doing the same thing in the same way and with a perfection impossible of attainment by hand-labor.

With a view of coming into direct personal contact with the non-professional side of dentistry, the writer accepted the very kind invitation of Mr. W. H. Gilbert, general manager of the S. S. White Dental Manufacturing Company, to visit their works on Staten Island, New York. The reasons that influenced this visit were many, but perhaps the most important of all was the desire to compare the work of the present with that quite familiar in the long ago. That this desire was fully satisfied needs no assertion here. It was one of those days that come infrequently in men's lives in which, apparently, the flood-gates of intelligence are opened and the mind stands, as it were, oppressed by the weight of its own ignorance.

The dentists of this country who gather at the annual convocations and look upon the beautiful collections of exhibits scarcely

give a thought to the amount of mental force and patient skill involved in their manufacture. They are to them simply instruments, the product of the mechanic. When, then, these unequally trained minds are brought, for the first time, in direct contact with the processes and mechanism necessary to produce these, they become simply appalled at their inability to grasp the harnessed ideas spread out for their contemplation.

It was with something of this feeling that the writer undertook, under the guidance of Mr. Gilbert and Mr. Johnston, the survey of about four acres of buildings with their contents. It requires a day's hard work to give merely a glance at the various processes, and a study of weeks, perhaps months, would be necessary to give a detailed description. It is, therefore, not the purpose of the writer to do this, but rather to give impressions of certain things.

It is, probably, the general thought that an instrument requires a certain degree of exactness in manufacture, but that it is necessary to bring this perfection to mathematical precision is, ordinarily, not a part of the dental comprehension. It is recognized in a general way that a watch can be made better by machinery than by hand, for that is of daily experience, but that the same absolute exactness of manufacture can be secured in dental appliances is, it is presumed, not generally considered or appreciated.

The first impression received is of the almost perfect unity and interdependence of each department of these great works with the other, and how by a wonderful system of organization errors are reduced to a minimum.

Another thought was uppermost in the mind during this examination, and perhaps more important than any other, that the mechanical side of dentistry is of as much value as the theoretical, and has been an equally pronounced factor in its advancement. When it is considered that this aggregation is but a part of the work of this house, and that it is but a fraction of a greater whole, distributed throughout the world, and that all this is the outcome of less than fifty years of effort, the question naturally arises, If this be the result of combined labor in that period, what may be expected from the first half of the coming century?

It is impossible to carry our readers from department to department, but to the dentist the metallurgical branch is full of interest, and to this we were first conducted. Here all the precious metals are refined and prepared for use. Here the sheets of gold are seen passing between powerful rollers so true that not a variation of a line is observed as they pass drawn down to the thousandths of

an inch. There, glowing with intense heat too brilliant for the unprotected eye, was the platinum furnace, melting several thousand dollars of this increasingly valuable metal, which, in a few minutes flowed out into the mould with an intensity of light equal to the sun at mid-day, and equally unbearable. This is cooled with difficulty, and the writer handled, while still warm, the largest amount of platinum ever seen by him.

From here to the manufacture of burs. It is presumed the average dentist, if he thinks at all of machine-made burs, has the idea that these are prepared in blanks, then run into a machine, and come out burs as we have them. If any one has such an idea, the long rows of machines, each with an attendant, would dispel this crude conception. Each instrument is made with all the delicacy of those used in watch manufacture. Each has a certain part to perform, and from the beginning until the final test, the work is a combination of mental qualities with mechanical perfection. One of the most impressive sights to the writer was the machine which at that time was polishing the blades cut in one of the smallest burs made. The accuracy and precision with which this instrument turned the bur to meet the travelling polisher was marvellous, and sufficient to rouse the dullest intellect to a comprehension of the exactness to which all these processes had been brought.

Perhaps one of the most instructive sights, as it indicated the great care exercised, was the row of workmen with microscopes, the stage illumined by an incandescent light, examining each bur as it came from the machine. Any imperfection observed caused its condemnation. Whether machine-made burs are superior to hand-made is a question to be left to those who use them, but there can be no dispute with the statement that these operations are conducted with a precision not obtainable by any hand-work, however skilful it may be. When it is remembered that this result has been attained through the mechanical genius of one man, Mr. A. W. Browne, and twelve years of patient testing, a limited idea may be secured of what it cost to form even so small an instrument as a bur, where the highest standard of excellence is demanded. These machines once seen at work cause words to seem weak in comparison to the results achieved by this wonderful mechanical intellect.

Leaving the manufacture of burs reluctantly, we enter the place where all the tools are made that enter into the production of everything in this establishment. This cannot be described in this article, and it will be sufficient to say that this is not only ex-

tensive, but of vital importance, as the tools must be rigidly exact and as near perfect as the skilled mechanician can make them.

Through the various branches, each distinct in itself, we suddenly are ushered into the presence of huge gasometers, reminding one of the gas-works of a small country town. These contain oxygen and nitrous oxide, and from these, through a system of pipes, the contents are conducted to another department, and there stored in iron cylinders familiar to the profession. The operation of filling these is of much more interest than that usually made familiar over the office chair.

The perfect organization of this extensive plant, where, of necessity, everything must have its place and be kept there always prepared for immediate use, is strikingly manifested in the arrangement of the tools. These are all placed in proper receptacles, the small upon prepared boards of regulation size for sliding in drawers and the larger instruments in separate cases. Each has its proper number and the purpose for which it is to be used carefully marked upon it, and then registered in a book kept for the purpose. When the workman wishes to prepare a certain portion of a hand-piece, as an illustration, the tools necessary must be applied for and a receipt given. This insures care upon the part of the workman and a certainty that all are in readiness to complete orders. The capital locked up in these innumerable drawers and cases can hardly be estimated.

The distinct parts of every appliance manufactured here must come together to form the perfect instrument, almost without the use of a file, and so exact is this that the separate pieces of the chairs are sent from the shops to the japanning-room with the certainty that they will go together without future injury to the surface.

When it is remembered that these separate parts must be made in vast quantities and stored ready to be put together at short notice, one is not surprised to find rooms of large size filled with stacks of various forms awaiting the assembling and final finish.

A hasty glance through the various departments devoted to the manufacture of rubber materials used in dentistry; the preparation of modelling compound and the various forms of wax; the interesting operation of twisting the cable wires for the engine; the weaving of the cords to run these and also the covers for rubber tubing, furnish a fitting close to the day's inspection.

Much might be said of the Johnston Brothers in this connection. Their scientific ability, combined with a broad collegiate culture of

the old New England type, has abundantly fitted them for the immediate management of this intricate and responsible work; part only, it is true, but a very important part of the S. S. White Dental Manufacturing Company's system.

To some it may seem as though this article was out of place in a dental journal devoted to professional topics, but the writer views it quite otherwise. From his boyhood he has intimately mingled with the mechanical side of dentistry, and has followed the fortunes of this house from its earliest inception, and has learned throughout it all that advancement in any line of work must be through many and oftentimes, apparently, diverse avenues, but, in the end, they meet upon one common level. Dentistry without its mechanical companion would be helpless, and the mechanical work without its complement, the professional, would cease to exist. It is, therefore, held that while the dental profession is not in full agreement with all the methods of trade, and can never be, it should recognize that where a firm wastes immense sums yearly to bring the tools and materials used in dentistry to perfection, and is satisfied with comparatively meagre returns as a profit on capital, selfishness cannot be charged as one of the over-mastering sins of all trade-workers. In our criticism let us learn to be just, and at the same time be sure that we also have passed through the furnace of a world's selfishness and have garments upon which there is no odor of fire.

DR. BONWILL'S VISIT TO EUROPE.

Dr. Bonwill will attend the International Medical Congress to be held in Moscow, August next, and requests us to say that he will *en route*, going and returning, be pleased to meet, at any of the stop-over cities, the members of the dental profession, and either give clinics or talk on any of the subjects with which he is familiar. He expects to be in Rome, Florence, Venice, Berlin, Leipzig, Vienna, St. Petersburg, and other places.

JOHN C. STOREY, M.D., D.D.S.

The profession of dentistry has had to mourn the loss of many of its devoted adherents, especially during the past two or three

years, but it is thought few will be missed more than John C. Storey in his own special field of work.

His reputation had long since passed the bounds of his State, and his name had become a familiar sound wherever dentistry was understood and appreciated.

Those who were brought in personal contact with him could not fail to be impressed with his energy, intellectual force, and genial companionship.

His professional attainments were a power for good in his own State, ever tending towards a higher standard of culture and a broader professional perception.

Our fellow-workers and companions are rapidly joining the host of the immortals, but their transition, while it leaves its shadow, teaches us the lesson that he lives best in the memory of his colleagues whose work has continued up to the hour and to the demand, "Come up higher!" Of such was John C. Storey.

EDWARD DRINKER COPE.

It is rare that the world of scientific thought is called upon to mourn the loss of one more distinguished than Professor Cope. His work, through a life of constant labor, has made his name an authority throughout the domain of original investigation.

It is not a common experience, at least in this country, to find men willing to set aside practically all the amenities of life in order to advance knowledge in any line of work, but this is exactly what Edward D. Cope did. Born to wealth, he used it in the advancement of science, spending a fortune in his investigations.

His collections have been of the most varied and extensive character; indeed, it may be doubted whether there is another single individual in the United States who has secured and prepared a larger number of specimens of extinct and living species.

His writings will be his best monument, for they represent the labors of a life, and will be regarded as equal authority with the names "not born to die" in scientific annals.

While not connected with the dental profession, his work was very intimately associated with an important part of its study, the comparative anatomy of the teeth, and he was always ready to meet in dental societies and take part in the discussions where the subject was one in which he was particularly interested.

His death will leave a vacancy difficult to fill, but the influence of his self-sacrifice to science will, it is hoped, be an incentive to the few to continue the labor with the broad and comprehensive spirit which always characterized his investigations and deductions.

PROFESSOR FRANK ABBOTT.

The painful announcement of the sudden death of Dr. Abbott was received as this number was being prepared for the press. We are not in possession of any particulars, and are, necessarily, obliged to reserve comment until our next issue. The death of this prominent worker in dentistry will create a profound impression and leave a vacancy in dental ranks difficult to fill. Whatever criticisms may have been passed upon his work, it must be recognized that his positive character left a marked impress upon his profession.

Bibliography.

Transactions of the American Dental Association at the Thirty-sixth Annual Session, held at Saratoga Springs, N. Y., commencing on the 4th of August, 1896. Philadelphia: S. S. White Dental Manufacturing Company, 1897.

This report is very satisfactory in one respect, at least, that it has appeared in good season and is a very creditable volume in general make up. The meeting at Saratoga was not all that it should have been, being especially weak upon the practical side of dentistry, but some of the papers are of special interest, especially so that on "Prosthesis Extraordinary," by Dr. E. A. Bogue, describing two operations by Dr. Michaels, of Paris, one on the restoration of the jaw to its original length, and the other on replacing the upper portion of the humerus, and both very successful, platinum and hard vulcanized rubber being used in both instances. This is certainly not only new in prosthetic dentistry, but reflects the highest honor on Dr. Michaels. It is worthy of special notice as showing what can be accomplished by an original mind coupled with mechanical skill.

The paper, by Dr. W. D. Richards, on "Artificial Pulps" is a somewhat original conception, and gives a very clear idea of the variety of forms assumed by pulp-canals, and enforces the statement of the essayist that this exhibit "would lead us to consider, after viewing what a tooth may contain, how far we may err in attempting to file pulp-canals perfectly, and how *immediate* root filling should be regarded."

The paper by Dr. L. P. Bethel, on "Lining Root-Canals" with nitrate of silver through the agency of the electric current (cataphoresis), is a paper of marked practical interest, and elicited much discussion for and against the views sought to be established.

In the same line may be classed Dr. Joseph W. Wassell's paper on "The Disinfection of Pulpless Teeth," and worthy of careful reading.

The paper by Dr. W. C. Barrett, on "The Orbicularis Oris and the Muscles of Expression," is one requiring special study, and this should be given it by all dentists who replace the natural organs with artificial dentures.

The reports and papers by Dr. J. S. Cassidy on "Materia Medica and Therapeutics," Dr. J. D. Patterson on "Physiology and Etiology," Dr. Thomas Fillebrown on "The Study of the Relation of the Frontal Sinus to the Antrum," Dr. H. L. Ambler on "Nodule on Apex of Root," Dr. Louis Ottofy on "Dental Education, Literature, and Nomenclature," and Dr. S. H. Guilford, with an exhaustive article upon the latter subject, all show careful preparation, and furnish valuable material for study and reference.

It is to be hoped that at the next meeting at Old Point Comfort, in August, 1897, the sections having in charge the practical side of dentistry will make an equally good presentation.

Annual of the Universal Medical Sciences and Analytical Index. A Yearly Report of the Progress of the General Sanitary Sciences throughout the World. Edited by Charles E. Sajous, M.D., Paris, and seventy associate editors, assisted by over two hundred corresponding editors, collaborators, and correspondents. Illustrated with chromo-lithographs, engravings, and maps. Philadelphia, New York, Chicago: The F. A. Davis Company, 1896.

This invaluable production of the incessant labor of Dr. Sajous and his collaborators is again presented to the medical public. These five large volumes comprise the work of the world in medical science during the year 1896.

Many of the abstracts are necessarily brief, but others are of reasonable length, and this must be regarded as a wise change, for it is the fault of all such compendiums that they frequently, by too great brevity, distort the meaning of writers. This has been appreciated by the editor, for he says, "To bring the usefulness of the Annual to its highest standard it was deemed advisable to increase the length of the abstracts so as to fully convey an author's meaning."

The editor further says in his preface, "While one-half a million words added to the Annual greatly enhance the value of each subject treated, the increase will naturally impose greater labor upon the physician who wishes to acquaint himself with the progress of the medical sciences as a whole."

To meet this difficulty a new department has been arranged, which is described as follows: "The Analytical Index and Cyclopædia of Treatment gives a summary of every practical article quoted in the Annual proper, and of all the criticisms introduced by associate editors. . . . The arrangement of this material is peculiar, a counterpart, as it were, of an international medical congress in brief, each subject being divided into sections." This arrangement of the editor to facilitate examination cannot be too highly commended. Covering, as it does, about three hundred and fifty pages in good, clear type, it will enable the busy practitioner to readily cover the entire field of the year's work in a short time.

The improvements in this series of volumes over that of previous issues may be found in "headings and side-headings, presented in large, black letters. All prescriptions are written out in full, and in the usual form. . . . All therapeutic subjects have been collected in the fifth volume. . . . Increase in the number of colored plates. . . . "

It has been a matter of regret, expressed in previous notices, that dentistry finds no place anywhere in these volumes. It is recognized that this has not been the fault of the editor, but exactly why this has not been done the writer has not been informed. It is rather late in the nineteenth century to permit old prejudices to enter into the production of this work, and it is not believed they have had any force in the omission, but whether or not the time has arrived when this branch of medicine should be made a part of the general healing art, for it is certainly of equal importance, and, in the writer's estimation, not in the least inferior to any of the so-called specialties of medicine.

The same careful work is evidenced throughout these five

volumes as in those previously issued, but the immense amount of labor given to their preparation cannot be appreciated by those not connected with similar work.

It is understood that Dr. Sajous, the editor, will remove to Philadelphia, and again place the editorial department of the Annual where it was originally established.

Clinique Dentaire et Dentisterie Opératoire. Par Ch. Godon, Directeur de l'École dentaire de Paris. Avec 62 figures intercalées dans le texte. Librairie J. B. Baillière et Fils, Paris, 1897.

This small volume is one of a series of books in the form of manuals, several of which have heretofore been noticed. This book is principally confined to operative dentistry, with such allusions to pathological conditions as seem necessary.

It is impossible in so small a work to do justice to the subjects treated, hence a book of this kind must be judged by another standard than ordinary productions. Its value consists in its brevity, a virtue especially appreciated by the overtaxed student. As it is a refresher of memory it can be recommended to French students who, it may be presumed, require such aids as well as their American brethren. Not a few on this side of the water depend largely upon similar manuals for a large proportion of knowledge obtained.

Catching's Compendium of Practical Dentistry for 1896. B. H. Catching, D.D.S., editor and publisher. Atlanta, Ga., 1897.

We are again presented with this valuable *résumé* of the dental work of the year 1896, published at an early period in the year 1897.

This journal from year to year, as this important book of reference has appeared, has given it a cordial recognition. There has been a lingering fear that the able editor and publisher, Dr. Catching, would find this task too burdensome and perhaps too unremunerative to continue; but evidently the end is not yet, if it is ever to come, for here is a volume of eight hundred and seventy-eight pages, neatly printed on good paper, and giving in condensed form the valuable matter of the year. When necessary the articles are given almost entire; especially is this the case in the scientific papers. This is a wise procedure, as frequently attempts at abstracting these papers make the matter almost valueless.

Dr. Catching has succeeded, as heretofore, in condensing the

substance of many articles, but few, it is presumed, will ever think of the great labor required to sift this from the mass of verbiage presented in the dental periodicals.

The product of each year, when thus brought together, does not make a very remarkable exhibit; in fact, original investigation is not a marked characteristic of dentistry in general, but it will be observed, both at home and abroad, that there is always a small contingent at work seeking to solve its remaining problems. As an historical record and a work of reference, this book has been, and will continue to be, of special value, and to the overworked dentist who cannot keep up with the monthly journals, but who still desires to have in his library the yearly work of his profession, this book is essential, and the general practitioner, who finds time for everything, needs it to refresh his memory in matters read but lost sight of in the busy whirl of active life.

Obituary.

JOHN C. STOREY, M.D., D.D.S.

Died, Wednesday, March 17, 1897, at 11.30 P.M., John C. Storey, M.D., D.D.S., aged sixty-one.

Dr. Storey died of congestion after an illness of only a few hours. He was engaged, when seized with the fatal attack, in preparing the April number of the *Texas Dental Journal*, of which he was editor.

Dr. Storey was born in Green County, Alabama, in 1836, and his father, Dr. John C. Storey, was one of the pioneers of that State. He was graduated from the Atlanta Medical College in 1857, and practised his profession in Green County from 1857 to 1860, and then removed to Louisiana. At the beginning of the war he enlisted in the Nineteenth Louisiana Infantry, and in 1862 was discharged on account of ill health. He afterwards re-enlisted as assistant surgeon, and from this time to the close of the war he was busily engaged in caring for the sick and wounded. At the close of the war he married Miss Wiley, daughter of Rev. Dr. E. E. Wiley, of Emery, Virginia. Four children were born of this union,—John E., Clarence L., Virginia E., and Theodora J. Mrs. Storey died June 27, 1891, and her remains were interred in Trinity

Cemetery. In 1867, Dr. Storey entered the Baltimore College of Dental Surgery and was graduated in 1869. In 1875 he came to Dallas, and has resided here continuously since that time. He was a member of the Southern Dental Association and of the Texas Dental Association, and had served as president of each of these organizations.

Dr. Storey was a member of the Presbyterian Church, having joined that denomination almost thirty years ago.

He was also a member of Camp Sterling Price, United Confederate Veterans.

The funeral services were conducted by his pastor, the Rev. Dr. W. M. Anderson, in the First Presbyterian Church, at eleven o'clock Saturday morning, March 20.—*Texas Dental Journal.*

PROFESSOR EDWARD DRINKER COPE.

Professor Cope, the distinguished naturalist and professor of Zoology and Comparative Anatomy at the University of Pennsylvania, died April 12, 1897, from disease of the kidneys, at his residence 2102 Pine Street, Philadelphia, after an illness of two weeks.

Professor Cope, who was a grandson of Thomas Pym Cope, the founder of the famous house of Cope Brothers, in the early mercantile annals of Philadelphia, was born in this city on July 28, 1840. He was educated at the Westtown Academy and at the University of Pennsylvania, and then studied comparative anatomy in the Academy of Sciences, this city, in the Smithsonian Institution, during 1859, and in Europe from 1863 to 1864. In 1864 he became professor of Natural Sciences in Haverford College, but resigned in 1867 on account of failing health. Later he became palæontologist to the United States Geographical Survey, serving first on the survey of the Territories and then on the survey west of the 100th meridian. His work in this connection resulted in his discovery of nearly one thousand new species of extinct and as many recent vertebrata. For many years Professor Cope was secretary and curator of the Academy of Natural Sciences, Philadelphia, and chief of the Department of Organic Material of the Permanent Exhibition in that city.

He was also a member of numerous scientific societies in the United States and Europe, and in 1879 he received the Bigsby gold medal from the Royal Geological Society of Great Britain. In 1872

he was elected a member of the National Academy of Sciences, and in 1884 was vice-president of the Section on Biology of the American Association for the Advancement of Science. In December, 1889, he became professor in the University of Pennsylvania, a position he held up to the time of his death.

Professor Cope has contributed about one hundred papers to the American Philosophical Society, Academy of Natural Sciences, the National Museum, and the publication, the *American Naturalist.*

Aside from this, he has written upward of three hundred and fifty papers which form a systematic record of the development of palæontology in the United States.

To the theory of evolution he made important contributions.

His researches have secured for him valued marks of distinction from several European institutions of learning.

The funeral took place Thursday, April 15, 1897, from the residence of his brother-in-law, Logan Station, near Philadelphia.

DR. HENRY F. BLAKENEY.

Died, at 143 Waverly Place, New York, March 13, 1897, Henry F. Blakeney, M.D., D.D.S., aged fifty-eight years.

Dr. Blakeney was a member of the first graduating class of the New York College of Dentistry, receiving his diploma December, 1869. He was also a graduate of the Medical Department of the University of Pennsylvania, but practised dentistry exclusively for twenty-eight years. He lays down his life a martyr from overwork.

Notes and Comments.[1]

Relation of Tuberculous Glands in the Neck to Dental Caries.—In a report made in the *British Journal of Dental Science,* Dr. Strack gives some observations made upon over one hundred infected children, and claims to have established a distinct relation-

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[1] The assistant editor solicits contributions for this department,—new methods, new remedies and formulas, or any short practical note which may prove of value to the practitioner or student. Address 1718 Walnut Street, Philadelphia.

ship between lymphadenoma and dental caries in forty-one per cent. of cases. In two cases he succeeded in discovering the presence of the tubercle bacillus in the tissues situated between the roots of a molar in direct contact with diseased glands. He considers it most important in treating these cases to extract all carious teeth, and in every way to place the oral cavity in a perfectly healthy condition.

ALUMINUM CROWNS.—The following statement is made in the *British Journal of Dental Science.* An aluminum cap was fitted to a root, the cusps re-enforced with amalgam, and the crown immediately cemented on with oxyphosphate of zinc. The patient almost immediately complained of a sour, metallic taste. The same day he returned, the crown feeling and tasting very unpleasant. Upon entering the office he pressed the crown with his tongue, when it came off, and in lifting it from his mouth it immediately became so hot that he could only hold it by letting it drop from one hand to the other rapidly. After a short time the heat subsided, when the crown was found to be riddled with holes.

THE BENEFIT OF SUNLIGHT.—Dr. T. B. Welch in his unique journal says of sunlight that it is as good a medicine for the invalid as it is a luxury to the healthy. A sun bath is a wonderful tonic, even to one who is too sick to walk out in it. The sick should, if possible, occupy the sunny side of the house, with plenty of sunlight coming immediately on the bed. Seek the sunlight is the advice of all present-day hygienists. Patients on the sunny side of the hospital ward recover soonest. The person who takes the sunny side of the street outlives his shade-seeking brother by many years. Sleep in rooms in which the sun has shed its rays during the day. And by all means the dentist should have his office so situated as to receive the sunlight during a portion of the day at least. In fact, better to have the light too strong in our offices than not enough, as the former can be modified with colored shades. If we receive sufficient sunlight we seldom need much medicine.

BALSAMO DEL PLATTO.—In writing upon this subject in the *Dental Digest*, Dr. Davis, of Denver, Col., says that this material is just as efficient as balsamo del deserto; in fact, is quite the same thing excepting that it is found in another locality,—along the shores of the Platte River.

To prepare balsamo del platto, take carbolic acid one part, oil of cassia two parts, oil of winter-green three parts. Then take the solid balsam, melt by heat, add some vaseline, and then add enough of the above formula to keep the balsam in a thick liquid condition, about the consistency of honey, when cold. It will have an aromatic odor, yellowish color, and will be very adhesive, even sticking to moist surfaces. In root-filling follow with a gutta-percha cone. For lining cavities, dissolve the balsam in chloroform or alcohol and use as a varnish.

Current News.

MEETING OF THE AMERICAN MEDICAL ASSOCIATION.

The semi-centennial meeting of the American Medical Association will be held in Philadelphia, Pa., June 1–4, 1897.

Much interest centres around it, since fifty years ago this Association held its first meeting in the city of Philadelphia.

Unusual preparations are being made to have it the most important meeting in the history of the Association.

The officers of the Dental and Oral Section invite the dental profession to attend this meeting and take part in the discussion of the papers. Those wishing to become members can do so by obtaining credentials from their State or local dental society and presenting them with the sum of $5.00 to the secretary.

The programme is here presented.

PROGRAMME OF THE DENTAL AND ORAL SECTION OF THE AMERICAN MEDICAL ASSOCIATION.

Chairman's Address . . . . Dr. R. R. Andrews, Cambridge, Mass.

A Plea for Conservative Oral Surgery, with Practical Illustrations . . . . Dr. G. Lenox Curtis, New York City, N. Y.

Sterilized Roots of Beasts' Teeth as Supports for Porcelain Crowns . . . . Dr. W. E. Walker, Pass Christian, Miss.

Tumors of the Maxilla . . . . Dr. Wm. Knight, Cincinnati, Ohio.

The Influence of Diseased Teeth upon the Adjacent Structures . . . . Dr. J. Taft, Cincinnati, Ohio.

Etiology and Treatment of Inflammation of the Anterior Pillars of the Fauces . . . . Dr. G. T. Carpenter, Chicago, Ill.

Pathologic Conditions of the Throat and Contiguous Structures during Early Childhood, Prime Factors in the Causation of Irregularities of the Maxilla and Teeth . . . . Dr. Wm. A. Mills, Baltimore, Md.

Dental Faculties in Medical Schools . . . . Dr. Richard Grady, Baltimore, Md.

The Need of Dental Instruction in Medical Schools Dr. Edward Branigan, Boston, Mass.

A Series of Clinical Cases . . . . Dr. Vida A. Latham, Chicago, Ill.

Hyperkinesis of the Muscles of Mastication a Symptom and an Etiological Factor in Nervous Affections, particularly Neuralgia of the Trigeminus, and Diseases of the Jaws . . . . Dr. G. V. I. Brown, Duluth, Minn.

The Relation of Dentistry to General Medicine . . Dr. Geo. F. Eames, Boston, Mass.

Cataphoresis in the Use of Electricity alone for Obtunding Sensitive Dentine. . . . . Dr. W. G. A. Bonwill, Philadelphia, Pa.

Fraternity . . . . Dr. A. C. McCurdy, Towson, Md.

Pyorrhœa Alveolaris in Mercurial and Lead Poisoning and Scurvy. Paper No. 4 . . . . Dr. E. S. Talbot, Chicago, Ill.

R. R. Andrews, Cambridge, Mass.,
Chairman.

Eugene S. Talbot, Chicago, Ill.,
Secretary.

RESOLUTIONS OF AMERICAN ACADEMY OF DENTAL SCIENCE.

The Academy, viewing with dismay the character of the advertisements appearing in some of the self-styled dental journals, whereby secret preparations, often of a highly dangerous character, are paraded in such company and guise as to deceive those not accustomed to scrutinize closely all medicines thus offered, and more particularly of advertisements soliciting dentists to advertise, announcing that "professional dignity and good advertising will

work well together," giving the name and address of the professional "writer of dentists' advertisements," and the unscrupulous acceptance of the above-mentioned journals of advertisements, the character of which is detrimental in the highest degree to the advancement of our profession, the best element of which is striving with self-sacrificing and untiring labor to make it worthy the name and title of a liberal and learned profession; therefore,

Resolved, That the Fellows of the American Academy of Dental Science strongly condemn such advertising, believing that it is degrading and injurious to the good name of the honorable calling they represent; and they further declare that the editors of such journals, allowing the common tricks of trade to dominate that which should be governed by professional dignity, are unworthy to be acknowledged as teachers and respected confrères among dentists.

Resolved, That this resolution be forwarded to the editors of the leading dental journals, as expressing the sentiment of the Academy.

BOARD OF REGISTRATION IN DENTISTRY.

A MEETING of the Massachusetts Board of Registration in Dentistry for the examination of candidates will be held in Boston, Monday, June 14, 1897, at ten A.M., at Dr. Dowsley's office, 175 Tremont Street. Hereafter the board will hold three meetings a year,—in June, November, and March.

E. V. McLeod,
Secretary.

New Bedford, Mass.

MICHIGAN DENTAL ASSOCIATION.

THE annual meeting of the Michigan Dental Association will be held this year at Battle Creek, on June 8, 9, and 10.

Henry C. Raymond, D.D.S.,
Secretary.

RECENT PATENTS.

A LIST of recent dental patents reported for the INTERNATIONAL DENTAL JOURNAL:

This is the list of dental patents issued March 16, 1897.

No. 577,507.—Dental plugger. Alfred Cane, Golden Gate, Cal. Filed June 11, 1895.

No. 577,638.—Furnace for dental use. John T. Barker, Wallingsford, Conn. Filed June 1, 1896.

No. 577,674.—Inhaler. Theodore B. Wilcox, Newark, N. J. Filed June 1, 1896. Assigned to Sharp and Dohme, New York, N. Y.

No. 577,681.—Inhaler. Harley M. Dunlap, Battle Creek, Mich. Filed January 4, 1896.

No. 577,682.—Syringe. Frederick Eissner, New York, N. Y. Filed January 30, 1896.

No. 578,729.—Dental clamp. J. Austin Dunn, Chicago, Ill. Filed January 15, 1896.

No. 579,094.—Dental chair. Mont C. Merker, Philadelphia, Pa. Filed October 28, 1896.

Design.—No. 26,678.—Dental tool for carrying amalgam. James W. Ivory, Philadelphia, Pa. Filed June 12, 1896. Term of patent fourteen years.

Trade-Marks.—No. 29,839.—Tooth-paste. Walter Benney, New York, N. Y. Filed December 15, 1896. Essential feature: The word "Regal" associated with a medallion and portrait. Used since July 15, 1896.

No. 29,840.—Dentifrice. Horace C. G. Luyties and F. A. Luyties, St. Louis, Mo. Filed October 31, 1896. Essential feature: The word "Sanitol." Used since August 15, 1896.

No. 29,841.—Dentifrices and preparations for teeth and gums. Purity Dental Specialty Company, Sullivan, Ind. Filed February 5, 1897. Essential feature: The representation of a calla lily in connection with the word "Purity." Used since August 16, 1896.

THE

International Dental Journal.

Vol. XVIII. June, 1897. No. 6.

Original Communications.[1]

ROOT-PERFORATION: A NEW METHOD OF TREATMENT.[2]

BY JOHN GIRDWOOD, D.D.S., L.D.S., EDINBURGH, SCOTLAND.

Among those of our profession to whom modern dentistry is something more than a mere expression, the title of this communication is bound to elicit interest. The man whose daily work is conservation and not substitution, who "crowns" and "bridges" undeterred by anything so long as he has faith in those lines of treatment and in himself, will see in it an attempt to cope with a real difficulty, which will, however, not be so apparent to him whose methods of practice are not strictly modern.

Whether perforation be the result of traumatism or of caries; or be situated in the side of a single root; at the bifurcation of two or more roots; or have travelled down the side of a fang from a supragingival cavity, it is at present deemed a condition so serious as to make the success of any remedial measures very doubtful. If we examine the literature on the subject its meagreness seems to express a certain shyness in handling the treatment of so uncertain

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[1] The editor and publishers are not responsible for the views of authors of papers published in this department, nor for any claim to novelty, or otherwise, that may be made by them. No papers will be received for this department that have appeared in any other journal published in the country.

[2] Read before the Academy of Stomatology, Philadelphia, April 27, 1897.

an issue, and what there is of it practically admits that the methods advocated are seldom, if ever, successful.

The varieties of perforation may be roughly divided, according to their causes, into two classes:

First. Traumatic, accidental in root-drilling.

Second. Carious, as the result of caries.

The traumatic variety is usually deep in the root and small in area, and is the more amenable to treatment if undertaken soon enough to prevent intrusion of the pericementum into the canal or cavity. The second variety generally occurs about the cervix, and is often very extensive. When perforation of either kind occurs it is followed, as indicated above, by intrusion of the soft tissue subjacent—hernia pericementi—and by pain more or less continuous until the sharp edges of the aperture have irritated the intruding soft mass till it becomes inflamed and gangrenous, sloughs, or gives rise to abscess.

The method of treatment most generally followed is that described by Dr. Evans in his book "Crown- and Bridge-Work," and which I shall briefly quote. "Inject the canals with peroxide of hydrogen, then bathe with alcohol, dry with hot air, and fill the canals closely, but not tightly, with cotton saturated with oil of cloves and seal with gutta-percha. Renew the dressing at intervals, preventing the entrance of saliva until the exudation of serum ceases at the perforation, and a film of cicatricial tissue has been formed. Dry the canal thoroughly and fit closely over the perforation a small, flat piece of gutta-percha warmed and applied with a gentle pressure sufficient only to produce adhesion without forcing the gutta-percha through.

"Previously painting the adjacent walls with chloro-gutta-percha will cause the gutta-percha to adhere readily," etc.

While I believe this method may sometimes prove successful where the operation of filling only is required, it is altogether unsuitable in the front teeth when these require to be "crowned." Moreover, the application of a piece of gutta-percha as described is a matter of extreme difficulty, except where the perforation is near the gingival end of a root, and, even when successfully done, the well-known property which gutta-percha possesses of swelling in the presence of moisture is certain, sooner or later, to produce the inflammatory changes leading to abscess of a nature almost incurable, because of the difficulty found in the removal of the cause except by extraction of the tooth. Other methods than the above have been tried, such as shaping a piece of quill, or a section of gold

tube to cover the opening, but all of these—which may be summed up as partial intubation—are open to the same objection. They are all, moreover, liable to displacement when a post has to be used in "crowning."

It is obvious, therefore, that for the successful treatment of perforation we require a material essentially different from anything of the kind up till now recommended. It should be sufficiently plastic to adapt itself readily and accurately to the tissues underlying the lesion without danger of displacing them; it must be non-irritant and insoluble, capable of becoming hard and resistant within a reasonable time, and of bearing considerable pressure without fear of movement or fracture. Such a material we possess in copper amalgam. Besides having the qualities already enumerated, copper amalgam is markedly antiseptic, a property of no small value in this connection, while the astringent action of its salts in allaying early inflammation are too well known to need comment here. Its application, which is nothing more or less than entire intubation of the perforated section of the root, is given in detail in the following cases:

My first case of traumatic perforation occurred about six years ago, in a right upper lateral incisor, which I was called upon to crown. The root had been filled some years before with gutta-percha. This I drilled out to what I judged to be about three-fourths the depth of the root, which, at this point, seemed to take a bend to the left. Having reamed out the canal, and fearing it was not quite deep enough to accommodate the pin, I unwisely proceeded to drill the canal a little deeper. I had almost succeeded to my satisfaction, when the patient showed sudden signs of pain, and on withdrawing the drill, wiping out the canal, I found traces of blood. I immediately dried out the canal and carefully dressed it with oil of cloves. Next day the case showed a distinct swelling on the gum over the seat of the perforation, but within three days this swelling had entirely disappeared and all irritation had subsided. At a subsequent appointment I removed the dressing, dried the canal out thoroughly, and proceeded to seal the perforation in the following manner:

Having mixed copper amalgam quite thin I gently carried a small portion of it to the apex with a blunt-pointed instrument rounded at the end,—in fact, an old excavator with the point broken off. The amalgam was gently spread round the upper portion of the canal, a rotatory motion being used to carry it evenly around the interior. No pain was caused by this proceeding, but the

patient was just aware of a very slight sensation while it was being done; this sensation subsided when the point was withdrawn. The interior of the canal being thus lined, its depth was not seriously lessened. The patient was now dismissed till the following day, when the amalgam had hardened thoroughly, and at the next sitting a Richmond crown was set, and has done good service up to the present time.

The next is a case of traumatic perforation of a different nature, near the apex of a second upper bicuspid root, in the mouth of a lady for whom I had, four years before, treated an extensive perforation at the bifurcation of a second lower molar, right, now crowned and doing good service.

Miss M. called about fourteen months ago and desired me to crown the left second upper bicuspid.

The tooth had been filled some years previously with copper amalgam by another dentist, and as it had become gradually more and more discolored she determined to have it crowned. I removed the filling and found the pulp alive, I destroyed and removed it with difficulty, the canal being long, flat, and contracted.

This last was then opened up with Gates-Glidden drills and the apex sealed. I now proceeded to enlarge the canal with Peeso's small-sized reamer, which I consider by far the best and safest instrument for this purpose. Having nearly succeeded in enlarging sufficiently for the Logan crown I meant to fit, and when I was using the medium-sized reamer and drilling slowly, the patient showed signs of pain; the drill was at once withdrawn and chips blown out. Suspecting perforation or a near approach to it, I wiped out the canal, but found no sign of blood. I now cautiously explored the whole canal with a stiff, hooked Donaldson bristle and found a tender spot quite close to the end of the root, which I cautiously pressed upon. Immediately the patient showed signs of pain. I now wiped out again and saw this time a tiny drop of serum on the cotton. Having swabbed out the canal with carbolic acid and dried thoroughly, I sealed the perforation with copper amalgam as in the former case. In this case there seems to have been no actual perforation by the reamer, but the wall was so thin that it would no doubt have yielded to the pressure of the cement during the setting of the crown, so that in all probability the actual perforation by the exploring point was the means of avoiding a more serious accident, for had I proceeded with the setting of the crown, there is little doubt that the thinned wall would have been bulged outward, and irritation set up of such

a serious kind that successful after-treatment might have been impossible.

In the treatment of carious perforation—the second variety—I have followed similar lines as shown in the following cases :

Mr. H. called about three years ago to have some teeth filled. On examination the left upper lateral crown was missing and the root almost entirely covered by gum. I proposed he should have it crowned, but was informed that this had been twice done about two years before, and that each crown had failed within a few days of its insertion. This had proved so discouraging to the patient that he decided to let it alone. About a year ago he again presented himself and requested an effort should be made to crown.

A thirty-per-cent. solution of cocaine was applied to the hernia-like knuckle of gum occupying the face of the root, and when this had been removed as completely as was deemed possible, a long, funnel-shaped opening was seen. This was washed out, and when bleeding had ceased was packed with cotton dipped in oil of cloves and hydronaphthol and lightly sealed with temporary gutta-percha. In twenty-four hours this dressing was taken out and the walls of the root explored ; these were found to be extensively softened and perforated on the left side well below the gum, which projected through the space. At the apex—sealed at previous crownings—about one-eighth of an inch of the normal canal was patent, the remainder being hollowed out as just described. The carious dentine was now cautiously removed by a spoon excavator and the perforation unavoidably enlarged, till, on the left side, it extended from the gum margin towards the apex for fully a third of the root's length, and a new perforation of a like size was made on the right side : thus of the gingival circumference only the lingual and the labial parts remained. This sacrifice, however, brought me to comparatively healthy dentine. The cavity was packed as before and the patient dismissed. At the third visit all traces of decay were removed and the interior of the root roughened for retainage. After careful drying out the soft tissues surrounding the perforation were lightly touched with carbolic acid to prevent ingress of serum and again dried with hot air ; copper amalgam was made very thin and plastic, and a little of it gently placed over the perforations and spread over them and their adjacent dentine edges with a round, straight instrument used with a rotatory and rolling motion. In the apex I now placed a smooth iron post, which had been thinly coated with wax,—it was merely heated, plunged in wax, and then cooled,—and round it tamped copper amalgam till

the canal was full. Next day this post was heated, the wax melted, and the pin almost dropped out. I then mounted a Richmond crown, which during the three years which have elapsed I have repeatedly seen, and which the patient assures me has never given a moment's trouble or discomfort.

In the spring of 1894, Mrs. M. presented herself at my office. An examination disclosed the right lower first molar abscessed, and with a small polypoid projection of gum growing from the bifurcation of the roots and projecting into the large carious cavity of the crown. Inquiry elicited that the tooth had been crowned some time before she came to me, but the crown had only remained on a short time, and had given rise to almost constant pain till it, fortunately, came off and gave her relief.

Having cleaned out the cavity as thoroughly as possible, I anæsthetized the polypoid portion of gum and cut it off. The decay around the margin of the cavity was thoroughly removed with large spoon-shaped excavators. Free hemorrhage ensued and was checked with hot water as in the other cases. A light dressing of cloves and hydronaphthol was next applied, and the patient dismissed till the following day. After the roots had been treated and filled, the perforation was touched with carbolic acid, thoroughly dried, and soft copper amalgam gently plastered over the whole interior of the cavity, anchorage being got by slight undercutting at the sides. A gold crown was mounted on the root, and has since done excellent work.

In another mouth and about the same time I discovered a type of perforation very commonly met with. The left upper second bicuspid presented an almost hopeless appearance on a cursory examination. The crown was gone and almost the whole of the root surface overgrown by gum, which I got rid of as described above.

Examination then showed a large perforation on the distal side of the root extending from the gingival margin to a point about one-third of the root's length above it. Higher up the pulp was found alive and was destroyed; the apex was sealed and carious dentine removed as far as was deemed safe. A cotton dressing firmly packed now simplified matters, and when the parts had settled into place I tapped the apical end of the root and screwed in a German-siver tube. Between the rough outer surface of this tube and the walls of the root I worked as much copper amalgam as I could safely pack, and in this way restored the shape of the root to the gum-edge. When this had hardened, the projecting portion of the tube was cut off and a porcelain-faced crown

mounted in the usual way. This crown is still in position and seems likely to remain.

The above cases all seem to me to point in one direction. They are all types, each varying a little but all common enough to most of us and none of them easy to treat. In other situations the merits of copper amalgam may perhaps be justly disputed, but here they are unquestionably good. The plan I advocate, even if by chance it should not give so uniformly good results as it has done during the last six years, is, I feel convinced, far more reliable than the lines of treatment hitherto adopted. Out of a very large number of cases I cannot record one failure. The result in cases formerly deemed most uncertain or even hopeless has indeed been such, that time and a careful trial of this method seem to me to be alone needed to prove that this question of perforation has been practically solved.

No doubt it will be objected that with due precautions perforation should not occur, but inasmuch as no man can see a root lying in the alveolus, measure its depth or gauge the thickness of its walls, he cannot in every case be expected to cope with abnormality with that degree of certainty which such objectors would imply as possible. In treating a difficulty the mental attitude of expectancy is not everything, we also require the physical sense of touch, and as the conditions imposed by abnormality are often such as to render ordinary precautions of no avail, accidents must happen unless the case be abandoned. Even when an abnormality is successfully diagnosed, the diagnosis does not carry with it perfect results in treatments. This being so, success in the less readily recognizable and quite unrecognizable forms becomes more remote.

If we consider the variations in shape, size, and curvature of certain roots, such as the upper lateral incisors, the upper bicuspids,—particularly the first, often bifid with flattened roots or coalesced canals,—we cannot wonder at an occasional accident even when the dentist is alive to its possible occurrence. Such an accident has, I regret to say, often happened in my hands during the past six years, and in every case the remedy here advocated has succeeded. It is, therefore, with the greatest confidence that I beg to record my experience and to commend its results to my professional confrères.

SOME POINTS IN THE ANTISEPTIC TREATMENT OF ROOT-CANALS.[1]

BY J. MORGAN HOWE, M.D., M.D.S.

Our friends the bacteriologists have so concentrated our attention upon the germicidal properties of substances that we are in danger of overlooking altogether the antiseptic effects of fillings made of inert or neutral materials. A root-canal that has had a living, or recently devitalized pulp removed from it by means of a clean broach, is the best possible case for immediate filling; and if such a canal is thoroughly filled with any inert and impermeable substance, it is placed in the most perfect and enduring antiseptic condition. That is to say, no germicidal substance, however potent, put into a root to eke out the imperfections of a filling, or mixed with a permeable material, will be so sure of maintaining an antiseptic condition as will a perfectly tight filling, because it keeps everything else out by occupying the space.

The first filling of a root-canal has been attributed to Hudson by Dr. Edward Maynard, who saw the work thirty-five years after it was done, in or about 1807. There were no germicides known as such at that time. The process was a mechanical one, laborious and slow, but all the more likely to be perfect in its results. It was mechanical antisepsis, although the fathers did not know any such word. We have made many advances, but we do not to-day know any other means so effective for preventing the pulpless condition of a root from being a source of danger to the tissues of the socket as the complete filling of the root-canal.

The progress which we cannot withstand is demanding of us to-day that we should make pulpless root-canals inoffensive, not occasionally, and with much labor, endurance, and expense, but that we shall do it often, quickly, and at a minimum of expense. Witzel, Baume, Loderberg, Herbst, Bödecker, Miller, and others have written on the proposition to impregnate the pulp-tissue with germicides so as to prevent putrefaction, and claims have been made that such treatment has been very successful. We occasionally hear, also, from eminent practitioners that filling roots with cotton saturated with antiseptic liquids is a very effectual means of accomplishing the object. But we know that dead pulps often remain in root-canals for years without treatment, causing no irritation of

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[1] Read before the New York Institute of Stomatology, March, 1897.

peridental tissues: or, if there is occasional irritation, it frequently passes away without becoming serious, just as often occurs in the case of teeth whose root-canals have been treated. Why may we not conclude, then, that leaving dead pulps in root-canals undisturbed is good treatment? Because we know what bacteriology has taught us, that danger to the periapical tissues is to be attributed to the results of the disorganization of the pulp,—the ptomaines or toxins. We must conclude, therefore, that removing a portion of a dead pulp is better than leaving it all in; that impregnating it with antiseptics must have an influence which lessens or postpones the evil effects that would be likely to follow unretarded putrescence; and that a permeable filling such as cotton, saturated with some antiseptic, is better than no filling, for it occupies a portion of the space that should be entirely taken up, and the potency of the antiseptic agent endures for a variable time. But these are all inferior means, allowable only because complete removal of pulps and thorough filling of canals is difficult, and in some cases impossible, and because temporary treatment is required for special reasons. The principle involved in the filling of root-canals is the removal and exclusion of organic matter. Inert material is all that is required, provided the space is all occupied. The difficulty of doing perfect work and the uncertain results of treatment of periapical tissues has led to the use of permeable material whose interstices are filled with germicides, and to considerations of the ease of removal of root-fillings. The occasional reports that are made of roots that had been filled with cotton, and found inoffensive after a number of years of perfect comfort, are very few relatively to the unreported cases of roots so filled that have caused irritation, inflammation, and abscesses, and occasionally reflex neuralgia for years, and when examined are found in the most offensive condition imaginable. Given an open foramen, and the latter condition would seem certain to result after a time. Absence of recognizable irritations is no criterion of scientific treatment here, for we all recall numbers of teeth which have contained putrescent pulps for years without causing the patient any trouble. We must act on our knowledge of the principles involved in cause and cure. Even temporary treatment of root-canals with cotton saturated with antiseptics and covered with gutta-percha, to remain during good behavior, has its danger in the liability to behave well long enough to be forgotten, and then to have the onset of inflammation occur at the most inopportune time. There is great temptation to busy and to lazy practitioners to do this kind of temporary work, because of the difficulty and, occa-

sionally, the impossibility of doing perfect work in root-canal filling. The patient ought at the least to be informed of the need of more thorough work at a later time. An incident of practice will illustrate from both points of view. I received an early call one morning recently to relieve a patient who had been up all night with toothache. The removal of some gutta-percha from a superior molar where it had not been subjected to attrition enabled me to also remove a cotton root-canal filling that was in a very offensive condition. Relief followed very quickly after such venting. The patient informed me that it must have been so treated as much as nine years ago, and that no serious trouble had occurred before, although occasionally it had been sore for a day or two. Up to the time of severe pain, and the uncovering of the conditions existing, this might have been claimed as successful treatment by both dentist and patient.

It is a consummation greatly to be desired that the process of rendering a pulp-canal permanently innocuous after the death of the pulp be simplified and made available to a greater number, while at the same time it is rendered less a matter of skill and endurance on the part of the operator. The requirements remain the same as when the knowledge was first acquired that root-canal filling was a cure for the evils following pulp devitalization. We cannot cheat dame nature, although we may find easier ways of complying with her demands.

It has seemed to me that the most promising suggestion of recent years in the direction of simplifying the effectual and permanent treatment of root-canals has been presented to us by Dr. L. P. Bethel. His paper on "Lining Root-Canals"[1] advocates the introduction of silver nitrate into the canals by the aid of the cataphoric action of the galvanic current, and the practicability of the process has been shown to us, from one point of view, by the specimens of teeth whose root-canals were filled with the salt and its compounds, which he kindly sent to one of our meetings. The complete filling of the most tortuous and smallest canals—and even the tubuli of the dentine in some cases—was shown to be entirely feasible. The substance occupying the canals seemed to be a compound of the silver salt with organic matter, and not the salt itself. This point could easily be determined by subjecting such specimens as we saw here to a water-bath; a compound of the salt would probably be insoluble, whereas we know the nitrate of silver itself is readily

[1] International Dental Journal, November, 1896.

soluble. It is just here that the value of Dr. Bethel's suggestion seems to hinge on the peculiar affinity silver nitrate has, and the compounds it forms, with organic matter. This is illustrated when it is applied to a decayed surface of the dentine; the decalcified substance forms a compound with the salt that is so nearly insoluble as to form an efficient protector to the underlying dentine for months or years. None of the gentlemen who criticised Dr. Bethel's method adversely seemed to regard the formation of an insoluble compound in a favorable light: indeed, it was hardly referred to, except to object to its utility; but in this fact, I think, is the great value of silver nitrate, both for the arrest of decay and, I hope, for the complete filling of root-canals. The chemical reaction that takes place when silver nitrate comes into contact with organic matter would of course include all bacteria, and they, as well as everything else organic, would become a part of the new compound, which is probably devoid of germicidal power, but destined, nevertheless, to serve the purpose if it will permanently occupy the space.

It has been noted several times that exposed living and, perhaps, aching pulps are effectually quieted, and may be subsequently removed without pain, if subjected to impregnation with silver nitrate by cataphoresis. I have no doubt that this is the result of the chemical effects of the salt on the nerves, as well as the other pulp-tissue, actually transforming them into a different substance. Like Lot's wife, they are something else before they know it.

I think that what we now know presents a hopeful prospect for the treatment, along this line, of hopeless pulps. If they can be converted into a solid mass of insoluble compound by chemical union with a substance that can be driven into them by the galvanic current, does it not seem as if the requirements for saving pulpless teeth are about to be fulfilled with much less labor than of old, and that the benefits of successful treatment may be greatly extended? The fact that compounds of silver nitrate are so dark in color may operate to limit its use to teeth posterior to the cuspids, but these are the very teeth that most tax our skill and patience, and for whose salvation it is most to be desired that a simpler method may be found. Then it is hardly supposable that this salt will prove to be the only agent that will combine with organic matter in such a way as to form a compound that will serve for the arrest of decay and the occlusion of root-canals.

One of the future advances that we may reasonably hope for is the discovery of an agent that will form a new and stable compound with organic matter, and without serious change of color.

When the chemistry of such reactions, and others which specially concern us, has received a fraction of the attention that has been given to the chemistry of photography, I have no doubt our hopes for the simplification of the processes of saving teeth will be realized.

But even if the necessity of mechanical root-canal filling should be to a great extent obviated, there will still be need of disinfecting root-canals and dentine, and of restoring to health infected tissues around the ends of roots that have contained putrescent pulps.

Disinfection is a chemical and germicidal process, while the treatment of living tissues belongs to therapeutics. I wish to refer briefly to the former process, and discuss a point in the disinfection of root-canals and dentine.

Dr. Black's valuable researches have shown that there is in dentine more than thirty-six per cent. of water and organic matter together, and this shows with great emphasis the importance of disinfecting this tissue, as well as the root-canals themselves, when the space occupied by such a proportion of it is filled with putrescent matter. A quite notable discussion of the means of effecting such disinfection has taken place during the last few years, which will be readily recalled to your minds if I call it the contention for coagulants and for non-coagulants.

Dr. A. W. Harlan has repeatedly expressed the opinion that trouble occurring in pulpless teeth under his observation, whose root-canals had been filled, was due to failure to disinfect the dentine because agents had been used to effect such disinfection that were coagulators of albumen. He claims that coagulating agents are prevented from diffusing through infected matter in tubes by coagulating albumen at the end of the tube with which such disinfectant first comes in contact. This is, I think, a correct statement of Dr. Harlan's objection to the use of coagulants. He has stated the question in the words, "Do coagulating agents prevent their own diffusion through tooth-structure?" Dr. Harlan's position has been endorsed by Dr. Black, and the negative side has been taken by Drs. Truman and Kirk. Both of the latter gentlemen have attempted to prove—and proved, I think—that a coagulum of albumen does not prevent the passage through it of agents causing the coagulation, or that the peripheral extremity of the contents of tubuli are affected by coagulating agents applied to the central ends. There has been much difference of opinion regarding the merits of this controversy, and a number of writers have taken sides pro or con, but there is one point that has appeared to me to have been over-

looked,—namely, that the claim, in the first place, that coagulants "prevent their own diffusion through tooth-structure" appears to be based on the apparent effects of coagulants upon normal albumen, and the contention, on the other hand, that the opposite of this statement is true is supported by experiments made also upon normal albumen, or that which has not been acted upon by the micro-organisms of decomposition; while the actual condition under consideration for treatment is that of a tooth whose pulp is dead and putrescent, and the contents of whose dentinal canaliculi have also been disorganized by bacteria. The reason for the need of disinfection of the dentine is that its organic part has become putrescent; what relevancy, then, has the action of coagulants upon normal albumen, when it has not been shown that the action of such agents on putrescent matter is to coagulate it in a similar way to its action on albumen?

Dr. Harlan has admitted that the use of a coagulating antiseptic in a root-canal which has had its pulp removed before putrescence has occurred is not objectionable.[1] It is in the condition that results after "various poisons" have been formed in the dentine tubes that objection is made to the use of coagulating agents; and in support of these objections experiments have been made with albumen, but no proofs have been presented regarding the effects of coagulants on the "various poisons."

The experiments on which Dr. Harlan rests his statements were not, so far as appears, applied to teeth whose dentine was filled with putrescent matter, and no demonstration has been made that disorganized matter is coagulable, as albumen is.

He says,[2] "The test is to introduce the agent into a tooth freshly extracted, from whence the pulp has been removed. . . . The agent was allowed to diffuse or not." There is no mention of the condition of pulp or of dentine in making the tests, but in all references, so far as I know, the argument is based on the action of coagulants on normal albumen. If admission should be made that coagulants prevent their own diffusion through organic matter in a normal state, the action of coagulants upon organic matter changed to a putrescent mass would still remain for consideration. The putrefaction of proteids results in the formation of solids, liquids, and gases, among which are leucin, tyrosin, a number of alkaloids, ptomaines, ammonias, hydrogen sulphide, etc. But it does not appear that any of these in the combinations in which they appear

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[1] Dental Cosmos, vol. xxxvii., p. 223. [2] Ibid., p. 211.

as the result of putrefaction are coagulable. The efficacy of a disinfecting agent for use in dentine would appear, therefore, to depend upon its chemical action on the mephitic compounds that occupy the tubuli, and upon its germicidal action, and not at all upon its coagulating or non-coagulating properties.

TREATMENT OF DEVITALIZED TEETH.[1]

BY LOUIS JACK, D.D.S.

The subject of preparation of the pulp-cavities of devitalized teeth and of root-canal filling has been so constantly written upon that it is difficult to present any line of treatment possessing newness. In accepting your invitation, the only thing available is to give the methods pursued by me in daily practice.

The subject is divisible into three sections: 1. Where the pulp has been freshly devitalized; 2, old devitalizations where no infectious conditions appear to exist; 3, old devitalizations where diseased conditions are apparent.

In respect of each of these classes, the preparation of all cases require such formation of the cavity or a special opening into the pulp-chamber and canals as may give directness of approach, to permit complete access, to effect cleansing of the root-canals and their subsequent occlusion. In respect of this, as applied to the upper molars and bicuspids, the best access is found by cutting through from the occlusal surface. But when the aspect of the cavity is mesio-proximal and the cavity large, choice must rest, of opening sufficiently from that direction, as otherwise the tooth will be unnecessarily weakened. Should the cavity be on the distal aspect, thorough preparation requires opening from the occlusal surface. The same principle of conserving the strength of the tooth applies to the incisors and cuspids. When they are strong, the approach is best from the lingual aspect, and where weak from the carious cavity.

Concerning the inferior molars and bicuspids, when the cavities are on the mesial proximate surfaces, the choice rests to open here with sufficient freedom. When the cavity of decay is on the distal surface of these teeth, the best approach is from the buccal aspect

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[1] Read before the New York Institute of Stomatology, March, 1897.

at a point near the cervix. In respect of this choice it is not necessary to make a large opening, since, by extending it laterally in each direction and also downward, the distal canal, and also the mesial one, can be easily opened, and may be filled through a comparatively small opening in the molar, and with the bicuspid, by drilling inward and downward, much less loss of structure is caused than any attempt to approach from the distal surface. Nothing so weakens a lower bicuspid as free cutting on its distal aspect. Having covered, in this general way, free approach to the root-canals, I will now consider the question of treatment applicable to each of the class of cases above cited.

Where the pulp has been recently devitalized, the chief considerations are, after the removal of all remains of the dead pulp, to preserve the most absolute cleanliness, to avoid the infection of the canal by the germs always present in the mouth, and the avoidance of infection by instruments which are tainted. It hence follows that the fluids of the mouth should be excluded, and that either new or thoroughly disinfected instruments only should enter the canals. I am careful, in the removal of the pulp, to use new Swiss broaches, the temper of which I immediately draw to a gray color and use, or if not absolutely fresh, I pass them through the flame; but as this is liable to burn the finer ones, it is generally preferable to take a new broach. There being no infection, there is no reason against the immediate filling of the canal.

Concerning the question of trouble ensuing to the peridental membrane from the putrefaction of the contents of the canaliculi, I have taken little account of, except in the teeth of young children, where I sometimes dress the canal with a twenty-grains to the ounce solution of zinc chloride. In all cases, however, I finally dress the canal with a saturated solution of aristol with gaultheria.

In respect to Class 2, there is no question of the necessity of approaching them with great caution, since, whether the tooth is without caries or has a cavity of decay, the greatest danger is of infecting the tissues of the apical region. This I believe is very frequently caused by injecting some portion of the contents of the canal through the foramen. This may be effected either by making compression by the use of large instruments in opening the cavity, or by inserting instruments within the chamber or canal previous to disinfection of their contents. My practice is to make a small opening into the chamber by drilling, or otherwise, and inserting a small crystal of potassium permanganate, allowing it to dissolve in the fluids there, or adding a modicum of water if the canal is dry.

In respect to the use of permanganate, it is important, in the front teeth, to use a weak solution, or to employ formalin, for the reason that there is danger of some discoloration of the dentine by the oxide of manganese. This is more particularly liable to occur with young children. When a portion of the detritus of the pulp is removed, I carefully convey on a broach a weak solution of permanganate.

I then close the canals with a thread filled with the solution of aristol before named, seal the outer cavity, and await indications of the possible previous infection of the apical tissues. If in forty-eight hours these do not appear, I proceed to fill the canals.

In respect to the third class, the subject is so complex that it is difficult in such an effort as this to go over the ground in detail, for the reason that the conditions are so various, in consequence of the varying impressibility of the tissues of different persons to infectious influences, and also probably because in different mouths the pathogenic character of the organisms vary in their virulence.

When there is a fistula and an open foramen, or where we can safely and surely make a small enlargement of the foramen, the case is reduced to simplicity, since a single irrigation of the fistulous tract with zinc chloride, five to ten grains to the ounce, or of ninety-five-per-cent. carbolic acid, will usually be sufficient to produce a cessation of the purulent discharge.

When, however, there is no fistula, the difficulty of disinfection is increased. My plan here is to expect a correction of the conditions by the slow admission of a disinfectant which in its nature is not irritating. For this purpose I loosely fill the canal and pulp-chamber with lint saturated with the solution of aristol, and fill the outer cavity around a root-filling instrument, of such size as will permit the effusions forming at the apical region to escape through the small opening left on the withdrawal of this broach.

The case is then repeatedly dressed in this manner, each time reducing the size of the broach-opening until at last its use may be avoided. Then I temporarily fill the canal tightly with a thread dipped in aristol as a tentative measure.

There is one class of cases of this kind where there is no effusion, but which will not tolerate closure. At each attempt irritation sets in, with threat of inflammatory conditions. I have found with these the greatest benefit to follow the use of a two-and-a-half-per-cent. aqueous solution of formalin, with which the canals are dressed. It is important to avoid forcing formalin through the foramen, since it excites a degree of irritation scarcely explainable. Neuralgic

soreness arises, not attended by inflammatory conditions. This condition does not easily abate. Therefore I throw out this caution. In passing, I may state that in the treatment of apical disorders there has too often been exhibited the disposition to use active medication when patient administration of milder disinfectants would be more efficient. After the active disturbances have passed, I continue the disinfection with aristol in one of the essential oils.

Canal Filling.—Concerning the filling of the canals, I generally air-dry them, and coat the surfaces with chloro-percha and insert hard cones of gutta-percha. In some cases I employ oxychloride of zinc. In large roots I feel it important to mallet into the apex a cone of gold-foil to perfectly occlude the end of the canal. With reference to the buccal roots of upper molars and the mesial roots of the inferior molar when it is not feasible to enlarge them, I rely upon the instillation of chloro-percha or oxychloride of zinc, but have to confess, in many cases, inability to either remove all the remains of the pulp or to secure perfect occlusion.

In conclusion, I would state that where there is reason to believe the canals have been filled when after-disturbance occurs, which does not at once yield to refrigeration and the application of iodine, I perform alveolotomy. The technique of this operation is to refrigerate the gum over the end of the root, puncture the gum, and drill directly into the apical region, making a small aperture. Before drilling, the gum-tissue at the puncture is pressed upward in order that the retraction of the gum will cover the drilled orifice.

The result of this operation usually immediately aborts inflammatory conditions by depletion, and also brings on irrigation of the apical tissues by the flow of blood. The result of alveolotomy where indicated is followed by salutary results.

TO WHAT EXTENT IS TYPHOID FEVER PREVENTABLE?[1]

BY J. L. HILDRETH, M.D., CAMBRIDGE, MASS.

Not long ago I read something that interested me very much with reference to the practice of law in London, in which a distinguished judge said that if one of his predecessors of a hundred years ago was to come back and sit upon the bench, he would find

[1] Read before the American Academy of Dental Science, January 6, 1897.

it just as easy as when he sat there before. I thought to myself that we were rather proud that we could not make any such boast about medicine. The man who would attempt to practise medicine this year as he practised it twenty-five years ago would certainly not maintain his hold upon the community, nor do as good work as those around him, and he would be looking for work elsewhere. The contrast is very forcibly brought out in this comparison between medicine and law; the practice of medicine is progressive, advancing from day to day, while the law probably remains as it did one hundred years ago.

I suppose it would be fair to say that this progress, which medicine has made, has been no more signal in any direction, and no more important in its results than in regard to our knowledge of the cause and the successful treatment of diphtheria. It certainly stands foremost in the work which the profession has done for humanity. Next to that, I think we may place typhoid fever. We cannot take the same forward step with regard to the treatment of typhoid fever as with diphtheria, and prescribe and use the antitoxin, but I think it is fair to say, with reference to typhoid fever, that we know quite as much about the cause and the course of the disease, the way in which it gets its hold upon the system, and the effect which it has on the patient,—we know a great deal more about it than we do with reference to diphtheria; and yet, when your committee asked what should be put on the card, I purposely put it in the form of a question, because I do not know that I, or any other medical man, could answer the question as to how far typhoid fever is a preventable disease.

I simply thought that I would state to you the facts with reference to typhoid fever as they are known to the profession to-day. Of course, I cannot expect that these facts will interest you as they do us who are in the harness of every-day work and seeing it everywhere, but they have great interest to the layman, as I think I may demonstrate to you, and after I have stated these facts, then I will let you, each one for himself, answer the question if he may, as to how far it is a preventable disease.

I know that in every-day life things that are very familiar, that are all about us, that are common with us, do not impress us as those things that we but rarely see. I remember, in the last epidemic of small-pox, that Boston was crazy over thirty or forty cases, while the fact that one-seventh of all the deaths that occurred in the city was caused by consumption awakened no thought or interest among the people, although the number of deaths was a

hundred-fold more from consumption than from small-pox. There is that same lack of interest when we speak of a middle-aged person having typhoid fever, because we see so much of it and have seen so much of it all our lives, but when you consider the great amount of typhoid fever that occurs every autumn, from August to November, and when you consider the length of sickness of each individual case, if the case runs a successful course, together with the term of disability which follows after the disappearance of the disease, and when you consider the amount that has been expended in the payment of the bill for nursing and the doctor's bill for a single case, and multiply that by the total number of cases, you will be surprised at the enormous amount which typhoid fever alone costs the people of Massachusetts. Take, for instance, our little Cambridge Hospital, which has had an unusually large number of cases the past six months, July to January, and where we have but thirty-four beds; we have entered eighty cases, having about fifty there at one time which we were obliged to do our best to care for on account of the great number that demanded admission. Now, if you stop to think that each case costs the hospital for the care and treatment (making no account of the cost of the plant, which originally cost something like one hundred thousand dollars, besides the equipment) about thirteen dollars; then if you remember that most of these cases that get into the hospital will certainly average as much as six weeks; then multiply six by thirteen and that by eighty, and you will see that you have a sum a little above six thousand dollars, which it must have cost our Cambridge Hospital this fall for typhoid fever alone. The cost to those persons who are able to pay for their treatment is no trifling amount, the expense of a nurse for three or four weeks and the attendance of a physician and the other incidental expenses. I think your president can well remember his first year in Cambridge when he had typhoid fever, and that the expense of it was quite a large sum. You know that a person is not only disabled in earning capacity during the continuance of the disease, but, many times, for two or three months afterwards; so that the expense of typhoid fever in Massachusetts, if we knew how much it cost to take care of the sick ones, and added to that the loss of wages,—which means a great deal to poor families, and even to those who are well-to-do,—would seem almost incredible. This is not all. The death-rate during most epidemics is rarely less than ten per cent., and oftentimes comes up to twelve, thirteen, and even fifteen per cent., so that the distress is great in addition to the loss.

There have been some very interesting epidemics of typhoid fever, and I will refer to the more remarkable, some of the earlier ones which attracted attention and which started the investigations which brought us to where we are now in our knowledge with reference to the development and extension of the disease. The investigation of one of these epidemics showed the facts to be that a man was going home from Vermont, and passed the night in a little village near the eastern border of New York. He was then suffering from the beginning of an attack of typhoid fever, the earlier symptoms of weakness, diarrhœa, etc., and through his diarrhœal discharges he contaminated a well which was used in the village where he passed the night, and in that village, the population of which numbered nine families, a total of forty-three persons, one-half of them contracted the fever and ten of them died. You will remember, the most of you, the great number of sick people who came from Philadelphia at the time of the Centennial in 1876, and were found to have typhoid fever. Nobody will ever know how many cases or deaths from typhoid fever could be traced to that exposition, or what was the cause of the epidemic, although it is very probable that the drinking-water was contaminated. A great many of these epidemics have been traced to the contamination of drinking-water, and the English people always speak of such epidemics as "water-borne" typhoid. One of the most interesting of these water-borne epidemics occurred in 1877 along the banks of the Ohio River. The water in the river became contaminated with the excreta from some case or cases, and the whole length of the river, a distance of some eight hundred miles, it was one epidemic of typhoid fever. Then in the town of Plymouth, Pennsylvania, in the year 1886, there was a contamination of a water-supply which was used by about eight thousand of the inhabitants. There were one thousand cases of typhoid fever in that town at about the same time, of which one hundred died, a mortality of ten per cent., and of those who contracted the fever, seventy-five or eighty cases were taken sick on precisely the same day.

You know, of course, that the number of cases of typhoid which were contracted at Chicago, during the World's Fair, was very large, but it was undoubtedly very much lessened by the precaution which they took to introduce Waukesha water, and a very few people, comparatively, used the water of the lake. I suppose if you should go into the larger cities, you would find a great many people who came home sick from the fever, contracted in Chicago,—I know that is certainly true of Cambridge,—but the

number was not so large as it certainly would have been if they had not taken the precautions they did.

With reference to armies, death by typhoid fever often reduces the ranks as much as the enemies' bullets. In the Civil War the number who died from typhoid was enormous. I tried once to get the statistics, but they wrote me from Washington that they had never been published. The statistics of the French army, for the period from 1875 to 1891, estimate the number of cases of typhoid fever to have been one hundred and thirty thousand, of which ten to fifteen per cent. died. You know that we had in Lowell a few years ago an epidemic which was caused by the excreta from three persons contaminating the water there, the Merrimac, at Chelmsford. I was asked to go there and see some of the cases; there was a difference of opinion as to whether they were really typhoid or not, but when I went into one of the wards and saw fifteen or sixteen cases in a room it reminded me of the hospital tents during the war-times. At about the same time thirty or forty cases appeared in Lawrence, and an investigation showed that the epidemic along the river was undoubtedly due to the contamination of the water by the excreta from those three original cases.

These epidemics of typhoid fever from contaminated water-supply have been known not only here, but have also been recognized in England. One of the most notable outbreaks was that which was known as the "Blue Hill epidemic," in which some of the excreta from two cases was cast out on the side of a hill in the winter time, and there came a rain and a melting of the snow, and this excreta was taken into the water and carried down to a town thirty or forty miles below, where the water was used for drinking purposes, and a very large number of people contracted the disease.

Later investigations have proved that typhoid can be conveyed by the use of milk, so that we now have milk epidemics as well as water-borne ones. One of the earliest of these milk epidemics took place in Cambridge, and for the successful investigation and the undoubted proof of its origin the Board of Health in Massachusetts has great praise. Since that time their expert, Professor Sedgwick, has examined twenty-eight epidemics which he has traced to the contamination of milk. The large number of cases which we had in Cambridge the past year was almost entirely due to milk. We have had three milk epidemics there in one year. I trust this may not influence any one from going there to live and making use of the educational advantages which we have to bestow,

and appreciating the beauty and convenience of the city as a place of residence,—but we have been unfortunate this year. In one of the epidemics seventy cases came down in ten days, and of these, sixty of them occurred in the route of one man. The proprietor of the milk-route was a very fine man, and he had no idea that the milk which was being delivered to his customers was carrying sickness and death to so many of them.

Another source of conveying the disease is oysters. As we sat at dinner I conversed with my friend from Providence, and I thought of the Middletown epidemic which they were unable to account for until they found that a great many of those who had been taken with the fever had eaten oysters which were grown in a portion of the river close to which there had previously been a couple of cases of typhoid fever, and it was learned that the dejectures were thrown into the river. English people have done more than we have in working up oyster epidemics. Fortunately, they are rare, but oysters must not be overlooked in the investigation of an epidemic.

Now, these sources of conveying the disease to patients are the ways that we know most about, but I fancy, as time goes on, many other ways by which the disease is conveyed will become known. But we have been convinced of one thing: that the germs of typhoid fever enter the body through the intestinal track, and probably in no other way. Our investigations have led us to the belief that no exhalations from any dirty source, no offensive smells or putrefying substances, will cause typhoid fever; that the drinking-water may be bad, vile in every way, smell, taste, and appearance, but unless it has present in it the germ of the disease, the typhoid bacillus, it will not produce typhoid fever. Now, this is the result of the later studies and knowledge that have been acquired in reference to this disease. We know that oysters and milk and water convey typhoid fever, but we do not know that it may not be conveyed in other ways. If you should take the statistics of a hospital and go over the typhoid fever cases and see, if it were possible, how many were water and milk cases you would find a great number which must have been contracted from some other source. Now, if you stop to think, you will see that those things that I have alluded to—milk, water, and oysters—are about the only food which we take into the system that is uncooked,—aside from fruit, as for instance, the banana, the apple, and the orange. These are not usually cooked, and it is possible may be sources of conveying typhoid fever and other diseases as well. Also, there is another

reason, which is that milk and water are believed to be the media in which the typhoid germs grow with the greatest rapidity; they are the best media for their culture, except some artificial media which are made from bouillon or something of that sort. Pettenkofer, who was really an extraordinary man, and who spent a great deal of time in the investigation of fevers, and Louis, another man who took a deep interest in the study of fevers, believed in the theory that typhoid fever originated from the ground in some way and that it might float in the atmosphere, and thus cause epidemics at certain times and places. We know of nothing to prove that emanation from the ground or from any unclean or decaying substance will produce typhoid fever, although I do not see why the germ should not occasionally get into the intestinal tracts through the air-passages.

Gerhard, of Philadelphia, in 1834, demonstrated that typhoid fever and typhus fever were distinct diseases. Before that time they were regarded as the same disease, although they knew that some cases presented ulcers in the intestines, while others did not, and these they called abdominal typhus. On the other side, Sir William Jenner, who gave us so much work on vaccination, published, in 1849, a valuable paper, in which he stated that the two diseases were then conceded to be quite different. Typhoid fever is due to lesions in the intestines and digestive organs, and in Peyer's patches, and the glands which are carrying on the process of digestion. Typhus fever is essentially a disease of the blood. We do not know very much about the cause of typhus fever,—that is, what germ is present in the disease,—but we know that it seems to find a very desirable habitation in jails and houses where men and women are crowded, and where they give little attention to cleanliness. It was this disease which was present in almost all of the ships of England in Howard's time, and was looked upon as a dreadful plague, as it certainly was.

The bacillus which is present in typhoid fever is very much like another bacillus which is present in the intestinal tract in health, not only in man, but in many animals. It is present in the cow and the horse, but, I believe, it is not present in the dog. It is called the *coli communis.* That bacillus when viewed under the microscope without any particular stain seems very much like the bacillus of typhoid, but it grows in a different media, and looks quite different when it is subjected to certain stains. Under the microscope these bacilli may be seen very readily with a twelfth immersion, but not with a power much below that. These photo-

graphs that I show you are simply to show the different shape and form and different lengths which they manifest when they are presented under the microscope. They are copied from a photograph by Sternberg, who has done a great deal of work in bacteriology, and are quite true to nature. The ordinary bacillus will average perhaps a twentieth of an inch in length when it is magnified one thousand diameters. As I have told you, the bacillus of typhoid looks very much like the *coli communis* which is present in nearly all animals, and is the commonest thing in the intestinal tract. Just here let me say something which may interest you and which is of great interest in the investigation of typhoid epidemics. Where you are looking for contaminated drinking-water, the present method is not simply by making chemical tests, not by taking a specimen of the water and placing it in a cone-shaped filter and examining the sediment under the microscope, but by making cultures from this sediment and growing them in various kinds of culture media, and staining them until the bacilli can be completely identified. I have no doubt that a great many mistakes were made by those who, years ago in examining drinking-water, found this bacillus which they thought the typhoid, but which was only the *coli communis.* It is not unlikely that many times the water examined contained the excreta from some horse or cow or other animal, and not understanding the difficulty of separating the *coli communis* from the typhoid bacillus, no doubt many mistakes were made,—that is to say, you cannot take the bacillus and stain it with one stain and put it under the microscope and say that it is the typhoid bacillus; you must go through quite a process of staining before you can be sure of the identity of the bacillus.

The discovery of this germ (although the possibility of its existence had been suspected by quite a number of workers) was made by Eberth, who discovered it and announced it in 1888, so it is less than ten years that we have known positively that there was a typhoid bacillus, and that in no case does the disease exist without it.

This is where we stand at present in our knowledge of this disease,—that the typhoid bacillus *must* be present; that it probably enters the body in no other way than through the intestinal tract, and there finds a medium which is agreeable and conducive to its propagation, and in some way gets into the glands which we call Peyer's patches, which secrete the material used in digestion, and also in the spleen. The spleen is a particularly favorable place for their growth, and it is said that you can get almost a

pure culture of the typhoid bacillus from the spleen of a person who has died with typhoid. Now, while these parts are the most favorable for the reproduction of the bacillus, and are what may be called its home, yet if it occasionally gets into the circulation,—by that I mean into the blood,—and is carried about and locates itself in other parts of the body, then we have what is called a typhoid septicæmia, a general poisoning of the body. These cases of typhoid take on very much the same form, and the person affected has much the same temperature-chart as one who is suffering from galloping consumption or miliary tuberculosis. Now, this is about all that we actually know with reference to the typhoid bacillus. We know nothing of its life outside of the body, or where it lives, or what it does. A good many laboratory experiments have been made with reference to its life in water, and it has been known to live for weeks and sometimes for months in water about the temperature of the body. Pruden froze the typhoid bacillus in a block of ice and kept it there for months, and when it was thawed out, he found the bacilli as lively and active and ready for work as if fresh from a patient. It is a very lively bacillus, always moving, kicking, and working about in all directions. No one has ever been able to take a bacillus and cultivate it and see it with anything below the twelfth immersion under the microscope, and even then it moves so rapidly in every direction that it is almost impossible to tell what it looks like. Of course, if you stain it you destroy its activity.

It is probable that this bacillus has a life outside of the body where it lives and propagates, and that we simply see it in its wanderings when it gets into the human body and causes so much trouble. What is still more remarkable is the fact that it is not the bacillus itself that does the harm. Its behavior and its life in the human body are precisely the same as with diphtheria bacillus, except that it does not produce its effect so quickly. The bacillus of diphtheria, although it is such a dreadful thing, does not of itself produce much trouble. It is the toxin which it generates and which is absorbed into the system that causes all the trouble. And the same is true of the typhoid bacillus: it is the toxin which it produces that causes the disease we call typhoid.

Now, right here I might say that it differs from diphtheria in one respect, and it is because of this difference that our hope of the future is very much less than with diphtheria. As I have before stated, the bacillus of diphtheria produces a toxin, and it is that toxin that causes the sickness and death of the patient.

Now, we have learned that as soon as that toxin is present in the system of the patient nature at once goes to work to manufacture an antitoxin which counteracts the effect of the toxin, and the patient's life is saved in that way. It has also been discovered, and I may say that it is one of the most important discoveries ever made by the medical profession, that we can produce diphtheria in the horse, and as the system of the horse manufactures the antitoxin, we may extract the horse's blood, and by injecting the serum into the diphtheritic patients assist them in overcoming the effect of the toxin and making the system an uncongenial habitation for the bacillus.

Unfortunately, typhoid fever cannot be produced in any of the lower animals. Very many experiments have been made in trying to produce the disease by inoculating horses, dogs, cats, rabbits, but without successful results. If we could produce typhoid fever in the lower animals, then we would go to work and extract the serum which they have made to enable them to throw off the disease and inject it into typhoid patients and thereby hasten the immunizing process which goes on in each individual, and so save many lives, just as we have been able to do in the case of diphtheria; but no animal has yet been found that can have the typhoid fever, and so far we have no hope of making an antitoxin which we can inject into the bodies of persons suffering from typhoid fever, and by serum therapy assist them in overcoming the disease.

It is a very curious fact with reference to the bacilli of diphtheria that while we understand more about them, we do not know how soon after being taken into the mouth they begin to manufacture their toxin, but we know that they work very rapidly, and begin to make their presence felt perhaps within a day. In typhoid fever, so many observations have been made that we know almost to a certainty that a person who drinks water which is contaminated by the typhoid germ—if they are susceptible to the disease—will be taken sick by the fourteenth day, so that, in case of a milk epidemic, for instance, if a person has taken contaminated milk, and passes by the sixteenth, or seventeenth, or eighteenth day, you may feel pretty sure he will not come down with the disease.

Before the introduction of the antitoxin treatment for diphtheria we used to say, when we were doing our best to combat the bacillus of diphtheria, that if the patient passed the fourth day he stood some chance; if he passed the sixth day, he stood a greater chance, and after the eighth day he was pretty sure to get well. With regard to typhoid fever, we now say that the twenty-first

day usually marks the crisis. I have been looking over the records of some of the cases in our hospitals, and I have been surprised to see how closely this rule is followed. In most of the cases the patient began to get normal after the twenty-first day, unless there was a relapse, a return of the disease, showing that the system had not manufactured antitoxin enough to control the disease. I had a good opportunity to observe this regularity in the time of the last epidemic in Cambridge and the epidemic in Somerville a few years ago. In tracing the route of the milkman who supplied the milk, it was learned that every one of the patients came down on the same day, almost precisely,—I think there were thirty-three cases that came down within one or two days. In that epidemic—the Somerville one—the young man who had the distribution of the milk, the milkman's son, had typhoid fever, and no doubt he was uncleanly in his habits and some of the dejections from the bowels got into the milk, which was a beautiful place for the germs to live, and consequently the disease was communicated to those who drank the milk. The Cambridge epidemic was due to a young fellow who had what we call "walking typhoid,"—that is, while he felt sick, he continued to work through it all, not being sick enough to require him to leave his work. When these outbreaks occurred, you could take a map and, by following the routes of these milkmen, mark down the limits of the epidemic. Of course, not all the people on these routes were taken down, because it is rarely, after forty, that a person contracts the disease, and, besides, some persons are not susceptible to the disease, just as you know some persons are not susceptible to small-pox or any of the ordinary contagious diseases.

There has been an attempt made to treat typhoid fever in the same way that Pasteur undertook to treat hydrophobia, which, as you know, was by taking the essence of the disease, the spinal cord, and making cultures from it, and injecting that, in dilute solutions at first and gradually increasing the quantities, immunizing them more and more until they became so that they were not susceptible to the disease. That was his method of treating rabies, and to some extent he thought he was successful. A method something similar to this was tried in typhoid fever last year, in the hope of cutting short the disease, with some good results; but it did not commend itself to the profession, and it has not been carried on this year.

It was early known that typhoid fever was contracted a great deal in the country, and that it was caused by contaminated wells; and even before the presence of the germ was fully understood, the

physicians in Boston made prophecies that if the water-supply of Boston was free from contamination, typhoid fever would disappear from that city. Dr. Henry I. Bowditch made that prophecy many years ago. In cities and towns where they are very particular with reference to their water-supply, and especially in those places where great care is also taken with regard to the use of milk, as they do in many of the cities on the other side, typhoid fever has been very nearly driven out. In Berlin and Munich, where there were severe epidemics some fifteen years ago, typhoid fever has disappeared now to such an extent, and is so rare, that the teachers in the medical schools and at the hospitals are scarcely able to find cases enough to teach their students the characteristics and appearances of the disease. I will mention here that the Germans rarely use raw milk; they will tell you that it is not fit to use, and I presume it is for that reason, and the efficient care that is taken of their water-supplies, that cases are not plenty enough in those cities for the teaching of the clinical appearance and effects of typhoid fever. Within a month or two one of the most distinguished physicians of Baltimore stated before a medical meeting that if the water-supply and drainage of Baltimore was put where it should be and the milk that was used was sterilized, he would guarantee the disappearance of typhoid fever from that city within three years. Many of our prominent physicians believe that if we were to use no milk except that which is cooked or sterilized, typhoid fever would soon be as rare with us as small-pox.

Now, you see that this brings a very important public matter to our minds; if these things are true,—and I believe them to be true,—you can see the great responsibility that rests upon the boards of health and the people who have charge of our water-supplies, and also upon the boards of health who have charge of our milk-supplies, to see that the water and milk which is supplied to our citizens is free from contamination, if you stop to consider for a moment the possible effects of this contamination. Take, for instance, the water-supply of Boston: if there should occur a case or two of typhoid fever on the borders of one of the basins, and some of these germs should get into the water of that basin, the bacillus, being such a lively creature and having such vitality, would soon find his way through the water-pipes and the faucets to those who used the water. It is very fortunate those things have not occurred; and this is another reason why boards of health are so strenuous and determined in requiring that all cases of typhoid fever shall be reported to them. Fortunately, also, we

have material, like corrosive sublimate and carbolic acid, which does destroy this bacillus. One of the most deadly mixtures which we can use for this purpose is the common lime-water that is used to whitewash fences. This is used at the hospitals, to be mixed with the excreta. Beside this, the most extreme care is taken that the persons who handle any of these dejections, or any of the clothing about the patient, shall wash his hands so that he may not convey the disease to others.

Boards of health of the cities and towns carry on various investigations and inspections still further. The State Board began quite a number of years ago to employ Professor Sedgwick in the investigation of these epidemics of typhoid fever. He goes to work in a very methodical manner: visiting the houses where there are cases of typhoid, he sits down and asks all about each case; finds out where they get their milk; asks if this patient drank the milk, and whether other members of the family use the same milk; and with these facts which he obtains he is usually able to locate the origin of the epidemic. It is a very delicate and painstaking task to work the problem out, but you would be surprised to see how satisfactory the results are. Oftentimes you would say, "That case is not a milk case," and you would look for another cause. In my investigation of one of the Somerville cases this summer, when I asked the question, "Did you get the milk of such a milkman?" they said "No, but of Mr. ——." As there was no epidemic on his route, I said to myself, "Now, this must be one of those cases which must have been contracted in a way other than by the use of contaminated milk, and it will be extremely difficult to locate its origin;" but the question was settled when the woman remembered and said, "But that man does buy milk from the other man when he is short of milk himself." Another difficulty you have to contend with is the assertion by the milkman that no one connected with the handling of the milk has had typhoid fever. One of the Somerville epidemics illustrates this point: Mr. —— did not believe that his son who handled the milk was suffering from typhoid fever; but when the young man died, we were able to show by the autopsy that he had had typhoid fever. Another instance of the difficulty of getting the true facts is well illustrated by a case that occurred at an institution where they raise their own milk. They had three or four cases, the origin of which puzzled the doctors very much. They produced their own milk, and as they had no cases at their institution, they did not see how it was possible for any one there to contract the disease. It turned out, afterwards,

that when they were short of milk, they occasionally bought milk from the milkman whose son had died from the fever, and that this milk was used only by those sitting at one table, and that all of the cases came from among those who used this milk, and that none of those who used the milk they produced had the fever. You see how much can be done in working out the origin of these cases if sufficient time is taken, and you also see the reasons for the belief that many epidemics of typhoid fever are caused by contaminated milk. It seems to me that, to all intents and purposes, the proof is conclusive; at any rate, it is so accepted by medical men.

As I said in the early part of my remarks regarding water, that it might be filthy, vile, contaminated with all sorts of things, yet it would not produce the fever in those who drank it unless it contained the germs of typhoid fever. And so it is with milk Milk may produce diarrhœa, may produce vomiting, might be contaminated with various bad things, but the use of it does not produce typhoid fever unless the germ of typhoid fever is present in the milk. This discovery we consider one of the triumphs of medicine,—this knowledge that typhoid fever is dependent upon this germ alone and nothing else. How and to what extent it is a preventable disease, you see, it is not easy to answer. I believe, and I think that almost all the medical men believe, that in all probability fully nine-tenths of all the cases of typhoid fever are caused either by water or milk that is contaminated with typhoid germs. If we should adopt the custom that the Germans have, and use no milk unless it has been cooked, I believe we would get rid of a very large proportion of the cases we have each year. It is not necessary that the milk be brought to the boiling-point to make it perfectly safe; it may be Pasteurized,—that is, brought to a heat of 60° or 70° C., and kept at that point for some fifteen or twenty minutes. If treated in this way, it is rather more palatable, as well as digestible, than if it has been brought to the boiling-point.

At the present time boards of health are doing all they can, and doctors are doing all they can, to find when there are epidemics of this fever; and now that the people understand this matter better, when there is an epidemic, they will either stop using milk altogether or have it boiled; and, besides this, if there is a suspicion regarding the water, they will boil that also.

With these facts that I have given you, I will leave you to answer for yourselves how far typhoid fever is a preventable disease. And I will also ask you why we cannot achieve as much in

this line of preventive medicine as has been achieved in Munich and Berlin within the last fifteen years in lessening the large number of cases of typhoid fever that every autumn fill our hospitals and bring so much distress and suffering to patients, as well as to their friends who have to care for them and minister unto them?

ELECTRICITY IN ALVEOLAR INFLAMMATIONS.

BY WILLIAM ROLLINS.

In this journal I have called attention to the use of high-voltage continuous currents in treating inflammations about the jaws, and described a convenient form of generator. While testing this form of current I have also built a number of generators for producing the Tesla or high-frequency current, constructing them in accordance with the ideas of Tesla, Hertz, and Lodge, and as this form of current seems to be equally efficient and more certainly generated, a brief description of a very simple form of apparatus will be here described, which, though it contains no new ideas, is convenient in practical use, and may help some one who wishes to experiment in this direction.

First, the position of the resistance is of importance. On each main of the one-hundred-and-ten-volt Edison street circuit I place a carbon resistance of a sufficient number of ohms to allow one, two, three, or four ampères of current to pass. This resistance is placed on the wall, out of reach of danger from short circuit, which, as in using this current in cataphoresis, is to be carefully guarded against.

The wires from this permanent resistance are brought to another variable resistance near the operator's chair. The wires leading from this second resistance are connected with the terminals of the primary of an induction coil, in the circuit of which is a rapid break. The terminals of the secondary of this coil lead to the primary of a second coil with the usual spark gap. In the secondary of this coil the patient is placed. Enough current may be passed through his body to feebly excite a Crookes tube in series with him without pain. Tesla showed some years ago that an ampèrage great enough to produce serious consequences, with a slow interruption, was harmless and painless if the interruption were rapid, so that no one need hesitate to use such a current in

dentistry, if arranged as here described, provided the patient takes hold of the terminals before the current starts and holds them until it stops. The mechanism for stopping the current is a foot-switch, which is placed in the main circuit, between the patient and the resistances. If this matter proves of sufficient interest, I shall be glad to figure more perfect, though more complicated, apparatus for the purpose.

DR. ROBINSON *VERSUS* DR. YOUNGER, IN REFERENCE TO IMPLANTATION.

BY LOUIS JACK, D.D.S.

In the paper read by me before the Academy of Stomatology of Philadelphia, December, 1895, upon plantation of teeth, and published in the INTERNATIONAL DENTAL JOURNAL, March, 1896, it was stated that implantation of teeth undoubtedly originated with Dr. Younger, giving the date of his first operation of this nature as June, 1885. Thereupon, a disclaimer to this credit was made to me by Dr. M. H. Robinson, of Alameda, California, who states that he first described the operation of inserting teeth in the alveolus where teeth had long been absent. As evidence of this he cites a paper read by him before the California Dental Association in 1880, and published in the *Dental Jairus.* Further, he declared that before the same Association, in 1881, he defended the propriety of the same operation, he stating that Dr. Younger was present.

Dr. Robinson in his communication required me in the cause of historical accuracy to correct my apparent misstatement. This I can only do by giving a short abstract of the proceedings of the California Dental Association, as the amount of matter bearing on the question is too great to be copied *verbatim.* It should here be stated with regret that the stenographic notes of the discussions, particularly of the year 1881, have been destroyed.

In the *Dental Jairus*, volume i., No. 8, page 339, August, 1880, Dr. Robinson described substantially, in the following quotation, the operation since designated as implantation. In this article the feasibility of inserting teeth in vacant positions of the alveolus is strenuously advised, and the operation is confidently laid down as correct treatment. It does not, however, appear that at this time Dr. Robinson had put in actual practice the operation he advised.

"The almost universal success of these operations—*i.e.*, transplantations—is astonishing when we look at the records of them and see that the way they are performed is not only careless, but in many cases in utter violation of every principle that should guide us in such operations. When the genius of the profession is directed to these operations, so as to give them the attention they merit, we will soon know the modes and principles so well that transplanting or replanting will be operations with fewer failures than now follow ordinary nerve-devitalization. *Furthermore, we will soon see teeth transplanted into alveoli that have been without teeth for years.* Let me make this point emphatic. Mr. A. has lost an incisor and wears a cumbrous plate. He presents himself to the dentist and says he wants a real tooth there instead of that cumbrous plate-tooth arrangement. The dentist says call at such a time and I will perform the operation. In the mean time the dentist has found a suitable tooth for transplanting into Mr. A.'s mouth. He calls; *the dentist makes a socket in the alveolus, inserts the tooth*, and if a real live, useful tooth is a desirable success, then transplanting is a success, for it gives that result. So confident am I that teeth can be successfully *planted* into an alveolus where the teeth have been out for years, in a socket prepared by the dentist to receive them, that I would have no fears or hesitation in performing it whenever proper opportunity occurred."

On June 15, 1881, before the California State Dental Association, Dr. Younger reports since the meeting of 1880 three more cases of transplantation. "In one of these cases the root was *mutilated* on the whole of the lingual and buccal surfaces to adapt it to the socket into which it was inserted."

In one other of the cases he states he will have "either to deepen the socket by drilling into the bone or by pressure with the old root to induce absorption and thus extend the cavity." Here Dr. Younger was awaiting the offering of a suitable tooth, meanwhile keeping the socket open by the application of the previous diseased tooth. (See the Transactions for 1881.)

In the Transactions for 1883, page 277, appears the report concerning the altered root which had continued serviceable for nearly two years.

Page 267, same Session.—Dr. Younger describes his intention to remove two bicuspids for a boy and to insert them in vacancies in the mother's mouth where the teeth had been absent for five or six years.

Page 269, Ibid.—Dr. Younger disclaims having used teeth which had long been extracted (*i.e.*, old teeth), he stating that the only teeth he had utilized in this way were two which he had kept in condition for use by inserting them in a cock's comb.

Transactions Sixteenth Annual Session, August, 1885. — Dr. Younger reports a case of drilling a cavity in the alveolar process from which a root had been extracted four years before, and in which artificial socket he transplanted a healthy tooth.

Transactions of the California State Dental Association, Seventeenth Session, July, 1886, Page 436.—"*Dr. Younger.*—Transplantation and implantation, as I call my new operation, has so far realized my most sanguine expectations."

Ibid.—Dr. Younger reports a case where, after a tooth had been extracted for over thirteen months, he formed a new alveolus and inserted it in its former place; "union took place as rapidly and as thoroughly as if it had been a fresh tooth."

Ibid., Page 451.—"Dr. Younger gave a clinic on implantation,—transplanting a tooth into an artificial socket drilled into the alveolar process of Dr. J. E. Cummings."

Ibid Page 498.—Dr. Younger was questioned, "How long does the operation of implantation extend back?"

"*Dr. Younger.*—To the 15th of June of last year (1885)."

I have given such an abstract of the essential points from the proceedings of the California State Dental Association as will enable the profession to judge how much credit to extend to Dr. Robinson and how far Dr. Younger may be indebted to the outline of Dr. Robinson published in 1880, as suggesting to him the operation of implantation.

NEW FIELD SUGGESTED BY DR. WILLIAMS'S PAPER.

BY DR. G. A. MILLS, NEW YORK.

It was to be expected that the late paper of Dr. Williams would attract more than ordinary attention. Already one editorial says, "We do not see anything new in it." Dr. Williams makes no claims in that direction. What he has done is a demonstration of what others were thinking as true. Another editor has, it is thought, sought to make the paper substantiate his own claims published in his book,—viz., that decay left in a cavity will cause a continuity of decay unless it be powerfully cauterized. In

other words, he believes that the pathogenic organisms will keep on in their destructive work. I do not think his claims are intelligently sustained. It has been fully proved in thousands of instances that teeth have been filled over decay and there has been no return of caries, even without the aid of an antiseptic. Yet it cannot be advocated that the use of antiseptics may not be an advantage oftentimes; but my own view is that the environments will be decidedly changed by the cavity being hermetically sealed with a filling, shutting out the organisms absolutely from air and moisture. Dr. Black has emphasized Dr. Williams's paper largely because of the marked ability shown in his work, which has given a definition far exceeding his expectations, and puts the demonstration so clearly before every eye that it would seem that a novice could not fail to see the facts illustrated. To Dr. Black must be accorded great credit for his industry, which of itself is a marvel. Still, it must be recognized that he places more emphasis than is warranted upon his views of mechanical technique. It will doubtless be an aid to a much higher grade of skill in filling teeth, and it is thought that Dr. Crouse's criticisms are timely. A reconstruction of the "interproximate spaces" is, without a doubt, of value. But practical dentistry is of a far-reaching thought, and requires so much and such varied judgment in its application that the best service or the longest cannot be possessed by the largest number in pursuing one routine practice.

I sat and listened to Dr. Williams's statement concerning the usefulness of his demonstrations, and it was emphasized through him that which Dr. Black equally emphasized during his visit to the Stomatological Society a year ago, that the future success of dental practice could not so much be secured on mechanical lines as would come from the consideration of the secretions of the body. This thought I voiced in one of my New York letters to the *Dental Digest*, for it had been much impressed on my mind for a long time that the day would surely come when some one would bring to us knowledge in this direction. Dr. Williams heartily united in the same hope and belief.

In looking at this subject we cannot expect to succeed either on the line of environments or the changing of the secretions.

Some fifteen years ago I read in the *American Dental Journal* an article by some Baltimore man handling this subject of the secretions in quite a masterly manner. I then thought it made a decided impression on my mind. It only needs a hint to suggest that it is a well known fact that the secretions of the body are

made very variable by the sudden change of surroundings. Therefore we are face to face daily with these changes, and, I predict, it will be shown sooner or later that there is a decided influence for ill manifested in the mouth, and necessarily the teeth must suffer because of the unfavorable conditions. None of our labor can blot out the cause of disease, but we can do more than we have ever been able to do as yet by a study on these lines, which we are sure that Dr. Williams's paper largely suggests.

Abstracts and Translations.

THE MICROSCOPICAL ASPECT OF CERTAIN LESIONS INDUCED BY DENTAL CARIES.

BY A. HOPEWELL SMITH, L.R.C.P. (LOND.), M.R.C.S., L.D.S. (ENG.).

It would save a great confusion of ideas if three kinds of dentinal deposition were generally recognized: (1) Calcareous degeneration of the pulp, a constant accompaniment of caries, but also found occasionally in sound teeth as the result of vascular changes due to idiopathic or constitutional causes; (2) secondary dentine, occurring not only as a pathological process in cases of attrition, abrasion, or fracture, but physiologically, as the result of senile changes in both permanent and long-retained deciduous teeth; and (3) adventitious dentine, the product of caries.

Salter's[1] patient and remarkable investigations in this particular portion of dental pathology led him to classify all forms of dentine deposition as secondary dentine, and in a sense this was perfectly correct.

But the term seems to require a more definite meaning; for he describes under this one heading three forms,—viz., dentine of repair, dentine excrescence, and osteo-dentine or intrinsic calcification of the pulp.

The adjoining scheme is intended to show the chief results of pathological changes taking place in the dentine and the pulp of a tooth.

[1] Dental Pathology and Surgery, chap. xi. and xii., 1874.

I. *Calcareous degeneration of pulp*, through changes in pulp alone.	(α) Common. Due to vascular changes in pulp, in association with caries. (β) Rare. Due to idiopathic or constitutional changes,—*e.g.*, gout.
II. *Secondary dentine in pulp-cavity*, through changes in the primary dentine and pulp.	(α) Physiological. Due to senile conditions of both permanent and long-retained deciduous teeth. (β) Pathological. Due to attrition, abrasion, or fracture.
III. *Adventitious dentine in pulp-cavity*, through changes in the primary dentine and pulp.	Due to caries.

Peripheral carious stimulation of the dentine is accompanied by destructive as well as constructive metamorphoses; tissue waste and tissue repair go on side by side. At first the soft parts alone suffer; the dentinal fibrils and their enclosing tubules, in parts of their courses, are affected and soon become disorganized, the blood-vessels and tissues of the pulp undergo hyperæmic and other changes. Thus a superficial carious patch beneath the enamel is associated with marked cellular activity on the part of the pulp; while there is a loss of substance externally, there is a gain internally. This is exemplified in the formation under certain circumstances of "dentine of repair." In other words, caries, even in its early stages, usually leads to a deposit of new adventitious dentine on the surface of the pulp.

But later on bacterial agencies multiply and accumulate, advancement renders them still more potent, and development means destruction. For now not only do the dentinal tubules and matrix also become involved in the general dissolution, but any adventitious tissues that may have been developed rapidly break down, and soon the work of demolition is complete. A study of these phenomena possesses several points of profound interest.

(A) *Conditions associated with Superficial Caries.*

Viewed from a clinical aspect, it may be said that the commencement of caries is marked, as a rule, by one of two distinct types of lesions: (1) the not uncommon clean-cut cavity which by its general appearance suggests erosion; and (2) the usual cavity of decay. The former is distinguished by its position on the cervi-

cal portion of the labial aspect of the anterior teeth, and by its intense hyperæsthesia on receiving interrupted tactile impressions; the latter is recognized by its inability to transmit slight functional impulses to the pulp. Microscopically the difference between these two classes is well defined, the first named particularly presenting marked deviations from the usual type of decay.

(1) Here the subenamel region of the dentine contains not only the usual "granular layer," but also areas occupied by large interglobular spaces, which are distributed with more or less regularity throughout its substance. Micro-organisms are present in enormous numbers at the margin of the cavity, and fill the tubules for varying distances. Opposite the breach of surface a corresponding deposit of adventitious dentine with enlarged irregular tubules is observed. The layer of tissue "on the borderland of calcification" is increased in thickness and exhibits a greater quantity of calcoglobular masses than normally. They are, however, very small. In the pulp, slight hyperæmia and cell-proliferation have certainly occurred in this locality and its neighborhood; and the peripheral cells, which present many of the appearances of the so-called odontoblasts, are multiplied greatly. Beyond, the tissues may be considered to be normal, with the exception, perhaps, of the smaller blood-vessels, whose lamina are more or less increased in size. Rounded cylindrical deposits of new dentine constantly exist in the central portions of the pulp, and point to a degenerative process. The changes from the normal to the pathological areas are very gradual, no sharp line of demarcation cutting them off from the other parts of the soft tissues.

Referring to the statement just enunciated that "the so-called odontoblasts are multiplied greatly," it must not be inferred that these cells are merely increased in point of numbers. They are profoundly modified, inasmuch as they now possess certain new characteristics. Their nuclei have become elongated and flattened, and are rendered very prominent when any of the nuclear stains have been used, and perhaps they are more granular than usual. The cell walls are indistinguishable, chiefly from the fact that each odontoblast is compressed laterally by its neighbors. In some instances they are gathered into sheaves. Some observers might describe the appearances as being due to an indirect splitting-up of the cells, and it is not difficult to conceive an odontoblast, when once fully formed, undergoing the process of karyokinesis. In sections prepared by Weil's method (and for this the writer's best thanks are due to Mr. W. H. Must), macroscopically the tubules in

the primary dentine below the breach of surface are unaffected by stains, and clearly differentiated from other tubules, and a band of altered pulp-tissue extends right across that organ.

Thus at the very outset we meet with two most remarkable conditions, and our attention is immediately arrested by their presence. These are the multiplication of the numbers of interglobular spaces, and also of the so-called odontoblast cells,—phenomena which are entirely absent from all ordinary conditions.

There would, therefore, seem to be some connection between the subjective symptoms of pain and these fresh developments,—or at all events one of those fresh developments,—and this leads one to the conclusion that the degree of the sensitiveness of these cavities is dependent chiefly on the increase or diminution in the numbers of the interglobular spaces.

Bödecker,[1] in speaking of dental irritation in the case of ordinary caries, attributes the sensations of pain to "alternate contractions and expansions of living matter" in dentine and enamel, "conveyed from the periphery to the centre of the tooth, these intense contractions being induced by highly irritating agencies."

But it must be remembered that it is mechanical stimulation alone of the floor of these particular cavities that gives rise to pain; and we must infer, with greater accuracy in the light of our knowledge of the physiological stimulation of nerves and protoplasm generally, that the pathic disturbances are due here to direct impulses, which pass by means of the dentinal fibrils from the protoplasmic contents of the interglobular spaces to the ultimate ramifications of the sensory pulp nerves.

The occurrence of additions to the numbers of the long odontoblast pulp-cells does not admit of quite so easy an explanation, and on this question the opinions of those who have worked at this branch of the subject would be welcomed. The American author[2] just quoted has indirectly noticed, although he has not figured this phenomenon. He says, "The first change in the affected pulp-tissue is its reduction to an embryonal or protoplasmic state,"—a statement which is certainly not verified on examination of my own microscopic preparations. Further, he writes, "Should the lymph-tissue be reduced to its embryonal conditions as above indicated, the protoplasm present before transformation into basis-substance reappears, and *may break up into odontoblasts* or into *osteoblasts*. In the former case, the result of irritation of the pulp-tissue will be

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[1] Anatomy and Pathology of the Teeth, 1894, p. 288. [2] Op. cit.

dentine, in the latter *bone*." The method of thus interpreting the genesis of these lime-bearing cells is crude and illogical.

True bony formations are most rarely found in the tooth-pulp; such a case, however, has been recorded by Messrs. J. F. Colyer and Ackery,[1] but calcareous deposits are exceedingly common.

Compact osseous tissue consists of Haversian canals, concentric, and intermediary lamellæ, lacunæ, and canaliculi, with blood-vessels, osteoblasts, connective tissue, branched bone-corpuscles, and minute lymphatic systems. And if these component parts are non-existent, it is a mistake to pronounce the new formation bone.

The local increase in the numbers of the odontoblasts may show that, in certain situations, there is a greater need for the higher and more sustained exercise of their functions, these functions, in my opinion, consisting wholly of shielding the delicate pulp from incoming dangers; not by the production of dentine matrix, but by physiologically creating a larger or more concentrated area of trophic influence or control—if one may so speak—on the surface of that organ, whereby its vitality may be retained until the latest possible moment; or it may be that the odontoblasts have merely undergone cell-subdivision. This is probably the correct view to hold.

(2) Turning, in the second place, to cases in which the dentine is well-developed and free from irregularities, the subjective pain symptoms do not, as a rule, appear until there is almost penetration into the pulp-chamber, no matter how rapidly the carious encroachments may take place. But the pulp exhibits similar microscopical characteristics to those already detailed, the most obvious being cell-proliferation and odontoblast multiplication with isolated cylindrical dentine formations in the neighborhood of the vessels. Regional hyperæmia[2] is often present,—that is, the capillaries and blood-vessels are rather larger and have thinner walls than normal.

Pain here is undoubtedly due to lateral pressure on the nerve bundles, the chief factors being the hyperæmia of the blood-vessels, the cellular infiltration of the tissues, and the presence of new dentine nodules.[3] If inflammation supervenes, pain is greatly intensi-

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[1] Transactions of the Odontological Society of Great Britain, vol. xxv., No. 3.

[2] "Regional hyperæmia" is a term used in this connection to denote a localized partial hyperæmic condition of the blood-vessels. Thus one may speak of "coronal" or "cornual," "cervical," "radicular hyperæmia," according to its situation.

[3] See Sewill, Dental Surgery, 1890, p. 234.

fied by pressure on the pulp-tissues of the serous exudation from the vessels. It is probable also that pathological changes occur in axis-cylinders and sheaths of the nerve-fibres themselves.

The present research has not yet investigated the changes in the pulp (if any) which may be associated with "zones of translucency" in the dentine, nor in cases in which the caries has undergone spontaneous arrest.

(B) *Conditions associated with Deep Caries.*

When, however, caries has advanced as far as the formation of a deep and extensive cavity in the dentine, then fresh structures are seen and must now be described.

The odontoblasts at the cervical region are enormously multiplied in point of numbers and layers. The cells themselves are not enlarged, but possess prominent oval nuclei which are much flattened laterally. Interposed here and there are small, hitherto undescribed, translucent globules, structureless and non-laminated, but similar in other respects to tiny calcospherite spherules. These are seen at the dentine border between the cells, and sometimes in Weil's layer. At the junction of the carious region with the primary or first-formed dentine the latest deposited dentine has, at its periphery, the globular appearances observed during developmental periods. It takes aniline dyes more deeply than the normal dentine, from which it is highly differentiated. This new tissue may be called "adventitious" dentine,—a term which includes several varieties to be hereafter noted. At the place where the carious tubules open into this freshly deposited layer, the odontoblasts are considerably shrunken, and pressed inward towards the pulp. They are disposed in one, or at most, two layers, and their peripheral poles (dentinal fibrils) are greatly enlarged and swollen. The layer of Weil is most marked here. Micrococci and bacilli infect the newly-formed tubes, and in some places expand them. And where tubular expansion has been effected, there the odontoblasts are absent, their places being occupied by a homogeneous mass of broken-down cells, with a few nuclei scattered about. Intense hyperæmia is distinguished by enlargement and tortuosity of the capillaries and arterioles, their engorgment with blood, and emigration of leucocytes.

As the thin sheet of adventitious dentine gradually widens out the odontoblasts become elongated, remaining all the time in one layer, their fibrils, each with its individual enveloping tube, being of normal size, and stretching across the new dentine at fairly regular intervals. The cells themselves are sometimes gathered

into sheaves. With the widening of the sheet of dentine, they become smaller and shorter, and diminish rapidly in number, until they disappear altogether.

Meanwhile, the adventitious dentine presents the well-known appearance of areolation almost identical with that of the interglobular spaces. This areolar adventitious dentine is one of the most commonly recurring of varieties. The tubules which cross the spaces, sparingly filled with round and rod-shaped micro-organisms, enlarge greatly as they extend inward, and terminate with wide mouths at their pulpar extremities. This is probably caused by partial softening of the intertubular matrix. The structure of the pulp itself at this place is of the homogeneous character already noted. The dentine which fills the cornua of the pulp exhibits irregular formations, as if deposition had taken place in a hurried manner. Not only are nucleated cells with long processes embedded in the hard mass, but large lacunal spaces are frequent, each containing micrococci which have entered *via* the tubules of the primary dentine. In some instances this cellular dentine resembles somewhat the structure of sponge.

A bacteriological survey of the same specimens of hyperæmia and early stages of the lesions which Rothmann[1] has designated "partial acute pulpitis," and Wedl[2] "pulpitis acuta partialis," furnishes one with some valuable particulars as to the probable distribution of the micro-organisms in the pulp and surrounding tissue. Miller[3] has isolated, cultivated, and named the most important of the cocci and bacilli; here we have an opportunity of describing the probable routes of their invasion of the pulp itself. The micro-organisms, after their introduction into the pulp-cavity, are believed to make their way in chains, groups, or zooglia masses to the spaces between the odontoblast layer, the dentogenetic and ordinary pulp-cells on the one side, and the border of dentine on the other; and also to the interpolar (interfibrillar) spaces, and the intercellular intervals. Thence they travel apparently to the basal layer of Weil, although here they are not congregated in such large or such numerous masses. Whatever their point of entrance, they soon pass to some considerable distance along the line of junction of the hard and soft tissues.

Further, they are found in the substance of the pulp proper,

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[1] Patho-Histologie der Zahnpulpa und Wurzelhart, 1889.

[2] Atlas zur Pathologie der Zahne, 1893, pp. 68, 69.

[3] Micro-organisms of the Human Mouth.

chiefly arranged along the walls of the blood-vessels, in their interiors (when empty), and in the perivascular tissues. Infection of the nerve fasciculi most probably does not take place. The micrococci predominate largely over the rod-shaped organisms. The central and peripheral portions of the adventitious dentine are crammed with micro-organisms, but when the odontoblast fibrils with their sheaths cross the areolations of this new deposit, no cocci can be found.

From these investigations, therefore, it will be seen that, as a result, one is unable to coincide with Arkövy's theory of the phagocytic function of the odontoblasts.[1] They certainly possess a granular appearance, but a search for any micro-organisms which have become incorporated in the substance of their protoplasm or nuclei is attended with negative results.

If the course of the disease is progressive, inflammatory foci appear. These consist of proliferated connective-tissue cells (macrophages), pulp-cells, and mono- or polynuclear leucocytes which have escaped from the numerous enlarged capillaries, all having been attracted together by a kind of positive chemotaxis. The foci are very pronounced, commence at first in one or both of the cornua of the pulp opposite the carious dentine, and, as a rule, ultimately suppurate and form localized abscesses. Rapid destruction of the pulp ensues, and the undermined dentine finally gives way in the majority of cases.

Sometimes a certain amount of fibrification of the cells lying in the immediate vicinity of the abscess occurs, and what might be termed a rudimentary abscess sac is developed. We are led to believe that this specialization and grouping of spindle-cells is not merely fortuitous, but a deliberate attempt on the part of the pulp to heal the lesion. The condition is observed in cases of chronic caries, the adventitious dentine being then deposited in layers, and presenting a characteristic fibrillar structure. On the border-line of the hard and soft parts, the connective-tissue structure of the dentine matrix is well brought out. Islands of dentine in the body of the pulp suggest that they are nothing more nor less than calcified bundles of connective-tissue fibres mixed with cells; the process of their formation being analogous to that of intramembranous ossification of bone.

Leaving aside the further study of these lesions, we rapidly pass to a brief consideration of the

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[1] See Journal of British Dental Association, vol. xv., p. 602.

(C) *Conditions associated with Penetrating Caries.*

Limitation of time affords these notes opportunity of speaking of no more than two phases of one of the commonest conditions found in the mouth,—viz., idiopathic exposure of the pulp.

In median sections of teeth affected by acute caries, which has terminated in total inflammation and partial suppuration of the pulp, it is obvious that the cells appear degenerate altogether. Connective-tissue cells are broken down; the pulp-cells have become changed into indifferent cells with large square nuclei, and escaped leucocytes crowd the tissues. Even the odontoblasts themselves at the cervical region are metamorphosed into short cells with rounded nuclei, and at the coronal part are opaque, and seem to have undergone fatty or mucoid degeneration.

Finally, at the periphery of the pulp the small globular deposits, already mentioned, are found. The nerve-bundles have lost their definite structure, and though retained in position are evidently less translucent and more disorganized. There are no clear evidences of fatty degeneration in the sections under notice, although Wedl[1] describes this as existing in his sections of acute purulent pulpitis. The tissues are greatly condensed at the margins of the abscess cavity, the cells being short and fusiform, interlacing closely with each other. The blood-vessels are hyperæmic, and micrococci and bacilli are abundantly distributed throughout the tissue.

The last condition which we shall now consider is that of a phase of acute partial suppurative inflammation of the pulp, in which that organ has been subjected to the devitalizing action of arsenous acid for a period of not less than twelve hours.

In addition to appearances which denote the intensity of the inflammation,—hyperæmia, marked cellular infiltration, suppuration, and other changes common to acute inflammations in soft tissues,—a prominent feature is a large special form of dentinal deposit which is situated at the base of the carious opening into the pulp-chamber. It is irregularly rounded in shape. Its structure, in some places, is that of a more or less homogeneous matrix closely resembling that of hyaline cartilage; in other places it has a distinctly fibrous character. Distributed throughout, and with no attempt at uniformity of arrangement, are rounded or oval spaces containing one or more cells with large round nuclei. The cells vary very much in size, those near the pulp side being six or eight times

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[1] Op. cit., p. 71.

as large as the smaller ones near the dentine side. Towards the pulp side rows of encapsuled cells exist, some being multinucleated. The surrounding pulp-tissue in immediate association with the new deposit consists chiefly of fusiform cells arranged in bundles interspersed with small round cells, the former possessing oval, and the latter round nuclei.

This particular form of cellular or hyaline adventitious dentine does not occur solely in acute inflammations of the pulp; it is also seen in chronic inflammation with hypertrophy (polypus) near the lower portion of the pulp-cavity. In this case it may be accompanied by new dentine, which has a pronounced laminar structure.

In conclusion, a preliminary study of the patho-histology of these lesions leads one to the following deductions:

(1) That nearly every degree of dentinal change is attended with hyperæmia, and cell-proliferation in the pulp-tissues, and, generally speaking, the formation of adventitious dentine.

(2) That the latter may have its origin as a conversion or secretion of the dentogenetic cells, producing, on the one hand, the areolar or laminar, or hyaline varieties, when the formative cells alone happen to be concerned; on the other, the fibrillar or cellular forms when odontoblasts or connective-tissue cells are by chance incorporated in the deposit.

(3) That there are no proofs that the cells called odontoblasts take any part in the production of the matrix of the new dentines, the term being therefore a misnomer; and

(4) That the new dentines, by a system of extension from the affected areas, may be just as much subjected to the peptonizing action of micro-organisms as the primary dentine of the tooth.—*Transactions of the Odontological Society of Great Britain.*

Reports of Society Meetings.

THE NEW YORK INSTITUTE OF STOMATOLOGY.

A REGULAR meeting of the Institute was held Tuesday evening, February 2, 1897, at the office of Dr. W. St. George Elliott, No. 25 East Forty-fourth Street, New York City, the President, Dr. George S. Allan, in the chair.

The secretary, Dr. W. St. George Elliott, read the minutes of the previous meeting, which were approved.

COMMUNICATIONS ON THEORY AND PRACTICE.

Dr. George A. Maxfield.—I have been very much interested in the articles of Dr. Black on amalgam, especially the last one in the December number of the *Dental Cosmos.* As I have made my own alloys for the last thirteen years, I made some from the formula which, according to his tables, gave the best results, and I brought some of the cuttings to-night, that all may see the benefit of his method of annealing the alloy. When amalgam is first cut it sets very quickly. I have two samples here which were cut yesterday, one annealed and the other not. In this last article Dr. Black has endeavored to present methods by which manufacturers will be able to furnish a good and reliable article. He has shown by experiments the shrinkage and expansion of the different alloys, and to get an alloy whose shrinkage or expansion is very slight, and at the same time one which will keep an indefinite time without change, is the object desired. I made a filling of this freshly cut amalgam yesterday afternoon, and I hardly had time to finish it, it set so quickly. After the patient had gone, I mixed some more, and also mixed some that was tempered, comparing the two, and I found the tempered alloy could be worked about five minutes after it was mixed. The process of tempering is very simple, the alloy being kept in boiling water for fifteen minutes. Dr. Flagg, in his book on plastics and plastic fillings, speaks of it as "aging," and says if it can be kept in constant motion for some time it gives it that quality. Dr. Black tested this by placing the alloy on a machine in a woollen-mill, where it had a constant reciprocating motion, and, after leaving it there for some time, found that no effect had been produced on the alloy.

This formula is five per cent. copper, sixty-one and three-fourths per cent. silver, and thirty-three and one-fourth per cent. tin. This seemed to stand the test the best of all the formulæ he tried. There is still one great trouble that will have to be overcome, and that is in regard to melting the alloys. There is more or less loss in melting. Dr. Black has averaged about one-half of one per cent., yet he had one case where it was nearly three per cent.,—twenty-six grains out of eight hundred. I saw a statement, supposed to have been written by Dr. Lawrence some years ago, in which he said he always had a loss. It is not always possible to know what the loss

is. Dr. Black said he supposed it was tin. In the lot in which he had the heaviest per cent. loss, he could not tell what caused it.

Dr. Bogue.—He did not assay after meeting the loss?

Dr. Maxfield.—It simply weighed less. The specific gravity was the same.

Dr. Bogue.—But he could have made a quantitative analysis.

Dr. Maxfield.—I suppose he could, but he said he had not been able to as yet. To me this simple fact of tempering the alloys is worth a great deal.

Dr. Bogue.—Does Dr. Maxfield put the alloy loose in the water?

Dr. Maxfield.—No; I put it in a little bottle such as gold cylinders come in. Dr. Black puts his in a flask. Dr. Black says the quicker an alloy can be used after it is cut the better the results. It is not always convenient for us to stop and file the alloy as we want it. Many who do not make the alloys must buy them, and they want an amalgam that does not shrink or expand. It would be impossible with the alloy I first passed around to make a large filling or one of difficult access; but with the second lot one could fill several cavities before it sets. This alloy, before it is annealed, expands but does not shrink; but afterwards it shrinks five points.

Dr. Elliott.—The subject of amalgam is, perhaps, one of the most interesting we have at the present time. It is, however, wrapped up in a great deal of obscurity. I worked at it for a number of months some years ago, and arrived at certain conclusions which have in a measure been corroborated by Dr. Black, who deserves a great deal of credit for what he has done. He has discovered the true function of so-called "aging." The great trouble with us dentists is that we make up our minds that a thing is so, and state that it is so, but fail to offer any proof of our position. Dr. Black has made some variation in this matter, and has attempted to substantiate the statements which he has made. I read before the Odontological Society of London, I think in 1888, quite an extensive paper on amalgam. I tested over fifty amalgams for shrinkage, expansion, and edge-strength, but did not get a single real example of expansion. The principle I used—the specific gravity test—was not original, for it had formerly been used by Mr. Charles Tomes. I consider it preferable to the mechanical, which test must be imperfect, in my judgment. In the first place, the specific gravity test takes into consideration every part of the surface. The measurement system measures the changes in one or two directions only. One peculiar feature which I noticed, and which finally made me so dissatisfied with the investigation that I threw it

up, was the uncertainty in regard to the materials. Mayhew & Co., supplied me, and they are supposed to furnish the best in London, but they could not assure me that the metals were absolutely pure. Fletcher, of Warrington, says there may be a difference of ten per cent. sometimes between different parts of the same ingot. Amalgam seems to be always undergoing some change. I kept up the tests for three months, and there was more or less change all the time. I have an apparatus here for making new experiments. The vessel contains lukewarm water of the temperature of 100° F. The lumps of amalgam, about the size of large fillings, are put in and are kept in water during the time of the experiments, the heat being kept constant by this thermostat. We all know from a practical point of view that there are hardly any two amalgams which cut alike. Some are very hard, and some can be cut through very easily. Some, by test, were four times as strong as others. As yet we are very much in the dark. I do not think the antiseptic properties of amalgams are of much importance if we can have a reliable non-shrinkage metal. The antiseptic property was a necessity in amalgams that shrank, but the ideal alloy is one that while it does not shrink, yet does possess antiseptic properties, so that in case of a recurrence of decay, this property may prove useful. It should also keep a good color. Whether it is possible to make this happy combination I doubt, for the antiseptic property seems to be associated with the color, and to be in the ratio of its depth, but this is generally owing to the use of copper in the alloy, and might be avoided by substituting a metal having a white oxide, and yet possessed of the necessary tooth-saving property.

The President.—I now have the pleasure of asking you to listen to Dr. Fred A. Peeso, of Philadelphia. A year or so ago I had the great pleasure of seeing a piece of practical bridge-work made by Dr. Peeso, and it impressed me so strongly as being the most finished piece of work that I had ever seen, so beautifully adapted, so practical and so clean, and did away with so many of the objections that are inherent with bridge-work, that it has been constantly on my mind to bring him to New York and have him not only show us some of the practical pieces that have been in the mouth, but also to explain to us the principle on which he constructs his work, and the tools he works with.

The doctor has brought with him some cases that have been in practical use for some time. These are valuable, and at the same time very instructive, and I am exceedingly anxious that every one should see them. I will ask Dr. Peeso to come forward and have

a stand in front of him with the cases on it, so all can get near and see them. So far as I know, these specimens are perfect in all details. They are not show-pieces. They were made for patients in want of them, and have been and are now being worn with comfort and satisfaction. We are greatly indebted to Dr. Peeso for bringing them on, and to his patients for allowing him to do so.

(For Dr. Peeso's paper, see page 285.)

Dr. Peeso.—While I was writing this paper I saw an article in one of the journals stating that if a bridge lasted three or four years it had done all that could be expected of it, and the dentist had fulfilled his obligation to his patients. If bridge-work would last no longer than that it would certainly be a complete failure, and should not be recognized by the profession.

These cases are all practical, having been in the mouth for longer or shorter periods, most of them being extreme cases of bridge-work, and many of them having but one anchorage. They were started as an experiment, but in every case they have proved most satisfactory. Until I see some ill results following their use, I feel that I am justified in adhering to the methods which I have found so useful. These pieces are not plated, as has been suggested by some one, but are polished in the manner described.

Dr. Peeso then exhibited the pieces he had brought with him, and explained the same.

The secretary then read a paper by Dr. Adam Flickinger, of St. Louis, Missouri, on "Removable Porcelain Crown- and Bridge-work."

(For Dr. Flickinger's paper, see page 306.)

DISCUSSION.

The President.—Gentlemen, these two papers are now before you for discussion, and, if you please, we will hear first from Dr. George Evans.

Dr. George Evans.—What we have heard this evening indicates Dr. Peeso to be an honest and enthusiastic worker in the specialty of crown- and bridge-work.

I fully agree with Dr. Peeso in his introductory remarks on the subject. The usefulness of the profession to the public depends on its art. Judged from that stand-point, crown- and bridge-work is one of the most important branches practised at the present time. Most practising dentists are gradually becoming convinced that it is a branch which can no longer be ignored, and that knowledge of it is a necessary requirement.

Properly practised, crown- and bridge-work approaches a fine

art, but misapprehension of the principles underlying it and lack of judgment and skill in their application have conspired to mar the value of this most valuable branch of dental prosthesis.

Surgical and mechanical operations of the most delicate nature are involved in crown- and bridge-work. Nothing in dentistry demands finer manipulation. There is no branch in which experience tends more to contribute to successful results, and a high position in dental art should be accorded it. Those who are interested in its advancement grow more confident of the value of crown- and bridge-work and its principles in conservative practice. They also appreciate the fact that an elevated position in dental prosthesis has been acquired for it, as it has been added to the curriculum of every dental college in the United States as an advanced branch of education. I agree with Dr. Peeso regarding the abuse of bridge-work. Its value entirely depends on conditions being favorable to its insertion, and then skilful construction. Either lacking, it is the worst form of denture the patient can have, in fact, a misfortune. This is the reason that so much injury is done to persons patronizing fraudulent dental offices, and the good name of crown- and bridge-work is blurred.

Regarding the methods of construction of removable bridge-work as presented by Dr. Peeso, they show a careful method of procedure. They are those most generally used for that style of work with some novelties introduced.

In the trimming and shaping of natural crowns and roots I find corundum paper disks and strips a useful adjunct in smoothing the cervices and sides. The great objection to removable bridge-work is the intricacy and labor of construction. In my own practice I almost entirely limit its use to the lower jaw. My present practice of using a combination of oxyphosphate and gutta-percha for cementing makes the removal of a fixed bridge for repair or other purpose an easy matter. I will say, since I have seen Dr. Peeso's work, that it is in finish and construction equal, if not superior, to anything of its style that I have ever seen.

The President.—Will Dr. Evans please explain his method of using gutta-percha and cement together, so the permanent pieces can be easily removed?

Dr. Evans.—Take, for instance, a single collar crown with a a post. I believe in good long posts, as stated by Dr. Peeso. Having everything ready to put on, I dry the parts, using the hot-air syringe. I heat the crown as hot as I can safely without fracturing the porcelain, and then paint the post with chloro-

percha. The heat quickly evaporates the chloroform, leaving the gutta-percha. When the crown chills a little, I insert it in position, and as I do that the gutta-percha is moulded or scraped to the sides of the post. I do not wait for the crown to cool, but instantly remove it. I then scrape from around the base of the post in the cap any surplus that may be there. When the crown has cooled, I replace it on the root and see that it goes into position. I then cement the crown on with oxyphosphate, placing the cement in the root-canal, the same as if no gutta-percha had been placed on the post. If it is attached to a bridge, to remove it I take a short-pointed root-canal dryer, and heat the bulb portion nearly red-hot. I protect the lips of the patient with a napkin and apply the silver point of the dryer to the metallic part of the crown, telling my patient to raise the left hand when he feels the heat. When the signal comes I remove the instrument and then apply it again and continue to do so for intervals of a few moments at a time until the crown and post are uniformly heated. This heat gradually softens the sheath of gutta-percha around the post, and with moderate force the crown can be removed. I will describe briefly how I would cement a molar cap, a portion of the natural tooth having been lost. On that portion that would represent the vacuum inside the cap I put my gutta-percha in position. I warm the crown as I do this, and insert it in position in the mouth. I instantly remove the crown, and to the gutta-percha I have already placed inside the cap I add a film around on the sides. I place the crown in position and remove several times, heating and adding more gutta-percha until I have just about enough to hold it on the tooth. I then remove the crown and scrape from around the edges of the inside all that comes near the edge of the cap. Then I cement the crown on with phosphate as usual. To prevent the gutta-percha from adhering to the surface of the natural crown in the fitting, I paint it over with oil of cloves and wipe it nearly dry with absorbent cotton. The oil should be removed when ready to cement the crown.

To remove a crown cemented in this manner, heat should be applied to the grinding surface gradually, and, as a rule, the crown can be removed. There are some short crowns in which this method will not work, and in those cases use the oxyphosphate cement alone. To remove such a crown, drill a hole in the centre of the occluding surface, put in an instrument, and break the attachment, slipping off the crown. The hole can be filled with gold or amalgam when recemented. When caps on the abutments of a bridge

have been cemented on with this combination of gutta-percha and oxyphosphate, they can be easily removed.

The President.—We would be pleased to hear from Dr. Northrop.

Dr. H. W. Northrop.—This is an embarrassing position for me to be placed in, and I give Dr. Woodward, who enticed me here, all the blame. In a laboratory, alone, with my coat off, I feel at home; but before these gentlemen, as an orator, I fear I shall be unable to acquit myself creditably. I am not here to oppose bridge-work, but as one of its strongest advocates. There are so many different branches of bridge-work, each having its respective merits, that I do not feel justified in criticising any one of them, although some methods I prefer to others.

The paper by Dr. Flickinger, just read, applies more to the porcelain system of bridge-work, a branch in which I have had limited experience, as my work is mostly of the kind constructed of gold, which I advocate for durability and service.

Dr. Flickinger also dwells upon removable bridges, another feature which I have had little occasion to adopt in preference to cemented work, and only in cases where the latter could not be used. The successful results which I have attained fully uphold me in expressing myself so strongly upon these two points.

There are several objections to the methods practised by Dr. Flickinger I wish to point out; but these objections are only offered as my personal opinions, and may have been formed because of a lack of experience in those methods. First, anchoring bridges by means of bars or spans resting in the cavities of adjoining teeth and held in place by fillings, never appealed to me as being a sufficiently strong operation to withstand the strain which a patient will give to a bridge. I have often seen teeth, weakened by approximal cavities, split through the bifurcation of the roots under the strain of ordinary use. How, then, can we expect them to resist the extra strain of a bridge, especially the bicuspids, which I consider the weakest teeth for this purpose? Again, sensitiveness in a large proportion of the teeth will be so great as to prevent excavating the cavity sufficiently to insure a perfect anchorage for the bridge pier. I think the majority of operators will agree with me in this. Another point: at the cervical margin of the filling, where the bar rests, an opportunity exists for food particles to collect which would eventually cause a breaking down of the enamel.

The doctor calls attention to the contrast between his system and Dr. Brown's. The only difference I note is that Dr. Brown's bridges and bars are all made in one piece, and when once inserted

cannot be taken out, while Dr. Flickinger's bars are separate from the bridge and crowns. The bar is first anchored to the teeth, then the bridge put in place and held by small screws into the bar. I see no great advantage in the process except its convenience for removal in case of necessary repairs.

In the case of this single crown, he has the post fitted in the root with amalgam; the band attached to the crown is fitted about the root, then fastened with a screw. If he does not use cement, I think in time the root would decay. If it is cemented before being screwed, what advantage has the process over a crown made in one piece and cemented in the usual manner?

The doctor not being present to advocate his own methods and explain more fully his ideas, I do not wish to take advantage of his absence and criticise the work, but I merely discuss it from my own stand-point.

I approve of saddle-rests in many instances, although much bridge-work is done without any support whatever upon the gum, some dentists doubting its advisability because of the inflammation which might occur to the soft tissues. In extensive bridges where the back teeth have been extracted, leaving no abutment for that end, I use vulcanized rubber under the bridges as saddles and cement them in the mouth. No doubt such a process will be condemned by some, although it would not be if they could have the opportunity which I have had of observing the results. I have never seen any trouble from the gum under the saddles made in this way, some of them having been in use for six or seven years.

I have been experimenting somewhat in the direction of combining the best features of gold bridge-work and those of porcelain work by using the attachments and fittings which, for strength and durability, I believe to be best obtained by the gold-crown process, making the intervening teeth and saddle of porcelain, and connecting into one bridge.

If the experiments and tests of this combination prove fruitful, and a product strong and durable enough to do the work required of it by the patient is secured, I believe the acme of crown- and bridge-work will have been attained.

Dr. Woodward asked me to bring some specimens to substantiate my position. I told him I had nothing at the time which I thought would do justice to the subject, but he glanced about the laboratory and found several things which he persuaded me to bring. I will pass them around, and if they meet with approval, I shall be pleased that I brought them. Two of the models were

roughly made. The third case may show the durability of bridge-work. About five years ago a lady came to me for advice. On the left side of her upper jaw she had the central, canine, and second molar; on the right side, the central, lateral, and canine. She wanted a bridge on the left side, but I told her I thought it could not be durable, as her teeth were badly affected with pyorrhœa. She persuaded me to make the bridge, however, and to my surprise it lasted until a few weeks ago. I will now show the model, and I imagine I can hear some present say that the bridge caused the teeth to loosen and come out. But here I would like to emphasize the fact that the three teeth of the right side, which were not connected with the bridge, became loose and uncomfortable, and had to be extracted some weeks before I extracted the bridge.

Another case is that of a gentleman who had a bridge made for his mouth. It was imperfectly made, and soon wore out. This time he wanted something permanent. It is an upper case of eight crowns, anchored to the two canines and left second bicuspid with gold caps. The patient came into my office yesterday at three o'clock, and it is now finished, ready for the mouth. There is one feature about this particular case which I seldom make use of, and whether it is an advantage for strength I am not prepared to say,—that is, the plate rests upon the gum. I made it in this way at the gentleman's request. He speaks a great deal in public, and complained that with his last bridge there was a hissing sound from the top. I usually make these bridges with simply a half round form, of solder, grinding the teeth to fit closely to the gum.

I wish to say with reference to gold showing, that some people like it and some do not; if a patient insists upon having a gold cap, I feel it is my duty to make it. I try to persuade them to have a porcelain facing; but if they like the gold, and their friends like it, it is their business and not mine. With some people, where they would be apt to break the porcelain facing, I often resort to the gold caps in building up the teeth, having the wear come on the ends of the gold caps.

I hesitated about bringing these cases, because I thought this meeting belonged to others, and as I was invited for discussion, it was hardly fair for me to advocate and introduce other methods.

Dr. Brockway.—In constructing a bridge for the incisor teeth, with the canines in position and in good condition, what method would Dr. Northrop adopt?

Dr. Northrop.—My preference would be to excise the canine teeth and make good solid Richmond crowns, which would give as

much strength as any way that could be devised, and show no gold whatever.

Dr. Brockway.—Would it not be possible to make skeleton or open-faced crowns?

Dr. Northrop.—The only objection I have to that is that bands of considerable width must be had in order to hold the cement. With narrow bands, I have found the cement would dissolve and decay begin. I am opposed to a band, because there is not one tooth in a hundred that I could band which would hold the cement as well as a full cap-fitting. Very often the canines stand parallel with each other. Sometimes the widest point is farther apart than the neck of the tooth, and consequently the band is strained. I have heard of the method of burnishing the band to the neck of a tooth, but it is well known that if burnished to one side it will spring out at the other; so I do not approve of that.

Dr. Bogue.—Will Dr. Northrop tell us what cases he considers ought to be cemented firmly?

Dr. Northrop.—If I find a case where I can have a good attachment at each end I would cement the bridge, providing the shape of the teeth is such that I can get the bands in place and have them fit perfectly at the neck. The removable bridges I have put in are for very nervous people. I am sometimes afraid to put a permanent case in for fear that future work could not be done; so I put in a bridge that can be taken out, brushed, and cleansed by the patient. In cases where the back teeth have been extracted on both sides evenly I often make a fitting on the last tooth which is in the mouth, and, having a saddle-rest, connect those teeth with a band which does not rest tightly on the teeth or gum, but which can be cleansed. The presence of it is annoying to the patient at first. Sometimes I make what I call double cap-cases, making a gold cap over one or two teeth; then making another cap over that.

Dr. Bogue.—Would Dr. Northrop in certain cases cut down a good natural tooth to place a cap for a bridge anchorage?

Dr. Northrop.—Yes, in cases where it would be beneficial to do so. I do not think it is a sacrifice of a natural tooth to utilize it to give the patient two teeth. If it is ground down I do not feel that its life is endangered.

Dr. Bogue.—How long should a bridge last, the conditions being favorable?

Dr. Northrop.—My experience extends back to about 1887. I have pieces made and put in at that time which are as good to-day as when first inserted. Of course, it is possible for a crown to be

worn through, or for one side to wear off on account of hard service. I have in mind the case of one gentleman who has had a piece broken three times. It has a good attachment, too. Every time I put it in I build it stronger, and now it is about the thickness of a lead-pencil. There are times when teeth are very loose. I have heard it stated that some teeth were too loose to put a bridge on. I have seen bridges put in upon rather loose teeth, and believe that by the binding of the teeth together their life was longer than if they had been left alone.

Dr. Bogue.—Conceding that the durability of loose teeth so treated might be greater, how would it be with teeth that were reasonably firm?

Dr. Northrop.—After several years' service, I seldom find that the bridge has been any detriment, or that there is any more movement to the teeth than there was before. I do not say to patients that bridge-work is infallible, or that they will never need to have anything more done. I often tell patients that if they will assume the responsibility, I feel confident that they will have comfortable service enough from the bridge to repay them for the expenditure they make.

Dr. Peeso.—I have a case here which I was requested to show as a way not to fit a band. It speaks for itself. Each one has his own ideas in regard to removable and permanent work. Where pieces are extended and a saddle used it strikes me that removable work is an advantage. As to the durability of crown- and bridge-work, if the conditions are favorable, and every part of the work carefully and thoroughly done, it is permanent. If I may be pardoned for referring directly to my own practice, I will say that since the fall of 1888 I have done a great deal of bridge-work, and in all that time there have been but two or three cases which have not proved entirely satisfactory from the first. I have kept track of all the work that I have done, and it is seemingly as good to-day as when put in the mouth. In many cases where roots are loose, if work is given them to do, they will become strengthened, as is the case with any muscle in the body. As to the pieces that I mentioned as not turning out as they should, in one case failure resulted from disease, the piece having been left out of the mouth for some months, and when it was replaced the conditions were changed and the piece was rendered worthless. I was exonerated from all blame by both the patient and the physician. In the other cases the trouble was but temporary.

Dr. Elliott.—I had hoped to have considerable time in which to

present several things to the Institute this evening, but I am glad that the time has been so much more profitably occupied. I want to show some of these things to-night, because I cannot remove them from the office.

At a recent meeting I spoke of the use of cataphoresis and the adoption of certain modified forms of apparatus. I have one here on the wall; it can be very readily examined by any one. The only original feature is in the rheostat below, which I had made to order. I use the street-current with a pressure of about one hundred and eighteen volts and the Willms controller. The milliampèremeter is below. The controller has very fine gradations. The rheostat has six steps,—5, 10, 15, 25, 35, 50 volts. I commence with five and have one hundred and ten steps in the controller, which gives me a great deal of gradation. I do not put the negative pole on the wrist now, having done so on several occasions with rather unpleasant results,—red marks and blistering,—but place it in the mouth. It is made of a copper ball placed under the rubber dam. Where we wish to remove a pulp it is necessary to keep the patient under the influence of the current for a long time, and to many people it is difficult to hold the electrode in the mouth for forty or fifty minutes, although I have done so for an hour and a quarter. This apparatus, invented by my son, is something like the gag used when giving gas. It is placed between the jaws, and has a universal motion, so the positive electrode can be placed wherever desired. I very seldom use clamps with the rubber dam, and never really find them necessary. The late Dr. Coffin, of London, introduced as a substitute beads on the silk ligature. The ligature and beads are placed on the teeth, and the rubber jumped over the beads. Using two silk ligatures, one is passed over the tooth and the other through the electrode and tied on, the patient thus being enabled to open and close the mouth.

I have here a vulcanizer of English make, of which the packing is lead and is permanent. I have never had any leakage from it. The regulator is made by the Dental Manufacturing Company of London. The advantage of regulators is very great, and for fifteen years I have used them. The vulcanizer can remain in action for hours, as the regulator keeps the gas absolutely at a fixed point. The advantage of a regulator with a dial over those without is that if one leaves the room he can tell on returning exactly what has taken place. The regulator is first set at sixty pounds pressure, and allowed to run at that pressure for half an hour, when it is turned to ninety pounds for one hour. That requires a slight effort

of the memory, and sometimes I have set it at sixty pounds and gone on operating for three hours, and forgotten all about it. That is unpleasant, but has had no disastrous results. This electric regulator has two weights attached to two levers, both supported by the electro-magnet. When the clock makes connection with the current the first weight drops, and in doing so turns up the regulator to ninety pounds. As the regulator requires some force to move it the electro-magnet could not accomplish it alone. When an hour passes the current is again turned on and the second weight is dropped, turning off the gas. In regard to this handpiece, I do not think it has ever been exhibited. It has a slip-joint, which is not like the S. S. White's, for it can be taken apart without a screw-driver or other tool. The point or bur is held without having to be screwed up, and runs true, but cannot be taken out without slipping back this ring. I have used it for fifteen years, and never knew it to fail. Of course it is not patented. On this same slip-joint I attach my right-angle, direct engine-mallet, and right-angle mallet, all original and tried. Let me here call attention to several kinds of pneumatic mallets, two being made of glass; one being rather curious, inasmuch as the point is attached to the flyer and strikes the gold as a hammer would direct, striking a much heavier blow, not having the inertia of the point-holder to overcome. The glass one has the advantage on account of its lack of friction. I also have a glass Bunsen burner, which answers the purpose better than the metal one, and, as the barrel is always cool, it can be turned up and down by the hand. Here is a soldering appliance for holding work in any position. Here is a compound Bunsen arrangement which can be used at any angle, or as a blow-pipe. Altogether there are some twenty-five appliances here, all original and mostly home-made, which all are invited to examine.

Dr. Brockway.—I would move a vote of thanks to Drs. Peeso and Flickinger for their interesting and valuable papers, and for the exhibition of models and finished crowns and bridges with which they have favored us. I would include also those gentlemen who have so kindly come to lead in the discussion.

The motion was carried.

Adjournment.

S. E. Davenport, D.D.S., M.D.S.,
Editor The New York Institute of Stomatology.

Editorial.

REPLY TO CRITICISMS.

The American Academy of Dental Science recently very properly prepared a series of resolutions in denunciation of advertisements in dental journals which in their character are derogatory to professional honor, and tend to the degradation of professional spirit. These resolutions point to two kinds of advertisements. The one class relating to the solicitation of dentists to employ advertising agencies to prepare for them their notices of professional skill, in which it is maintained "that professional dignity and good advertising will work well together."

In the advertising pages of this journal there have unfortunately appeared for several issues the announcement by two of these writers of dental advertisements.

It is proper here to explain how this has occurred. Our advertising matter is under the management of an agent, who pursues his efforts in a simple business manner, and who could not be expected to have the fine ethical sense in the situation which should obtain. The member of the board, whose function it is to overlook such questions, had in his pressing daily duties neglected to scrutinize the pages until his attention was called to it by the resolutions above mentioned. The order has been given the agent to eliminate such advertisements in the future.

The other kind of advertisements alluded to in the resolutions are those concerning secret preparations of a dangerous character. Concerning these, the rule adopted by us to exclude them from the Journal is that no such advertisement shall be accepted which is not accompanied by the formula, which must also be published as a part of the advertisement. Recently one of these has appeared in our pages where the contents of the preparation are given, but not the exact formula, which is not in strict conformity with the rule. This will not be again published.

We would be glad if the profession would sustain the application of the above rule to all secret preparations,—namely, amalgams, phosphatic cements, and similar preparations. The general profession certainly is at fault in the use of preparations where the

formula of their composition is not publicly declared. It would be a great benefit if the public law required that all preparations connected with the treatment of disease were obliged to have stated on the package the exact formula, with a penalty attached to the avoidance of this salutary requirement. This, considering the character of our form of government, would appear to be impossible of execution, since it comes within the function of municipal law, relegated to the individual States. Therefore no concert of action upon this question is capable of being secured among the different States. It is obvious that any attempt by one State would be inoperative in any of the others. The interests of private concerns are continually acting against the application and enforcement of any measure so well calculated to prevent the diffusion of a multitude of unsatisfactory materials for use, which it is plain are derogatory to the growth of professional character.

LOUIS JACK,
President of International Dental Publishing Company.

DR. FARRAR'S SECOND VOLUME.

THE second volume of this great work of Dr. Farrar on "Irregularities of the Teeth and their Correction" is nearing completion, and will be published in the early fall.

The writer had recently the pleasure of inspecting it in advance sheets, and in all its details it met his expectations. It will be a work about equal in size to the first volume, but differs from this in that it is confined entirely to practical illustrations of cases in the author's practice, as well as that of others. It is needless to say that this covers about everything conceivable in malposed teeth.

The text is profusely illustrated in Dr. Farrar's well-known style; and this, with concise descriptions, in clear type, will enable all to follow the methods and repeat the operations without difficulty.

When the three volumes are completed, as contemplated by the author, they will constitute a work unquestionably the most elaborate, as well as the most practical, upon the subject of irregularities attempted in this century, and it is doubtful whether it can be improved upon or duplicated in the next. S. G. Blood, 83 and 85 Duane Street, New York City, is the business manager for the author.

Bibliography.

Artificial Anæsthesia: A Manual of Anæsthetic Agents and their Employment in the Treatment of Disease. By Laurence Turnbull, M.D., Ph.G., Aural Surgeon to the Jefferson Medical College Hospital, etc. Fourth edition, revised and enlarged. Philadelphia: P. Blakiston Son & Co., 1896.

This work practically stands alone in a very important field. It has no rival, and needs none, as it treats the subjects anæsthesia and anæsthetics most satisfactorily. There are writers who have speculated profoundly upon the chemistry and others upon the therapeutics of anæsthetics, but Dr. Turnbull, who has had much and varied clinical experience, presents his work from the standpoint of practical experience. After presenting a history of ancient and modern anæsthetics, the author gives concisely a description of all the agents that may be successfully and safely employed for inducing anæsthesia, either locally or by inhalation, and presents the chief chemical tests of the purity of each substance considered, with its composition and properties. There is also described and exhibited all the useful methods of administering the various agents, with careful and minute directions as to the precautions to be taken to avoid risk to the life of the patient and just what to do in case of danger.

The relative mortality from all the anæsthetics is also embodied, which will assist the student in forming a fair and candid opinion of this important subject.

The author very justly gives precedence to ether as the most satisfactory of all the general anæsthetics yet introduced, and, as he infers, it is somewhat remarkable that the fourth edition of this work should be issued on the fiftieth anniversary of the discovery and introduction of this agent. Full credit is given Dr. Horace Wells as the discoverer of modern anæsthesia, and the author says, "We are only now beginning to do justice to his memory."

Considerable space is given to a consideration of local anæsthetics, cocaine being treated very exhaustively, and the claims of eucaine are set forth, which, however, have not yet been thoroughly established. The work closes with a too short allusion to hypnotism and its employment as an anæsthetic agent.

This is not only a book that should be in every dental and medical library, but one that should be carefully studied by every one who assumes the responsibility of inducing insensibility.

G. W. W.

Obituary.

FRANK ABBOTT, M.D.

Dr. Frank Abbott's sudden death on April 20, and noticed briefly in our last issue, has occasioned many expressions of profound regret throughout the dental profession. Few men were better known, for he has been an active and positive factor in dental work ever since he began its practice in New York City. His influence has been extended, and whatever place he may occupy in the future history of dentistry, it can never be truly written without his work filling in it a very prominent position.

Dr. Abbott's positive nature led him to advocate his views with an earnestness that oftentimes, if they failed to carry conviction, engendered respect for the man, for it was felt he battled conscientiously for the opinions entertained, and that without regard to the opposition aroused. With it all, he was genial in companionship, ever ready to help where help was most needed, and throughout loyal to his profession and its work.

This is not the time or place to analyze his labor as an author or investigator. His writings, in connection with the late Dr. Heitzmann and Dr. Bödecker, have been voluminous; and while these have not been accorded full recognition, they have had a powerful influence in promoting investigation in the special lines of work in which he was most interested.

Dr. Abbott was born at Shapleigh, York County, Maine, on September 5, 1836. He was descended from one of the earliest Puritan settlers in that part of the country, the first American representative of the family having arrived in 1640. Originally the Abbotts belonged to one of the most ancient races in Europe, having existed in Sicily for many hundreds of years. Frank Abbott was educated at one of the Shapleigh schools, and when he was twenty years old became a student in the office of a dental surgeon in Oneida, New York. Afterwards he removed to Johnstown, New

York, where, with the exception of a few months in 1862, during which he served in the army, he practised as a dentist until 1863. While at Johnstown he married Miss Catherine Ann Cuyler, also a descendant of an old American family.

In 1863 he came to New York and attended the lectures at the medical department of the University of the City of New York, and took his M.D. degree. In 1866, upon the formation of the College of Dentistry, Dr. Abbott was appointed clinical instructor, and in 1868 he became a professor and one of the trustees of the same institution. In 1867 he established the infirmary connected with the college, and became its superintendent. In 1869 he was appointed dean, a place which he held until his death. Besides being dean at the Dental College, he was professor of dental histology, surgery, and therapeutics.

Dr. Abbott was a member of the New York County Medical Society, the Academy of Medicine, the American Dental Association, the New York Academy of Sciences, the American Numismatic and Archæological Society, the University Club, the Museum of Natural History, and a member, from its foundation, of the Metropolitan Museum of Art. He was also a Fellow of the American Geographical Society, and connected with numerous other bodies. He possessed a celebrated collection of rare prints dealing with American history, and was an enthusiastic book and picture collector.

His interest in dentistry was not confined to local organizations, but extended to the national associations, in which he was an ever-present and active worker. He was made president of the American Dental Association in 1887, and was also presiding officer for one year in the National Association of Dental Faculties. His work in the latter organization was always appreciated by his colleagues, and his active interest will be more and more missed as the years pass by.

The writer feels his death a personal loss, for, while often in antagonism, the warm friendship of many years has never been broken. His aim in life was to lead, and such men are the true pioneers who make paths for others to follow, and of such the world has too few.

He leaves a widow, two daughters, Mrs. Willet Coles Ely and Miss Katherine C. Abbott, and a son, Dr. Frank Abbott.

His funeral took place at Johnstown, New York.

Current News.

RESOLUTION OF THE ODONTOLOGICAL SOCIETY OF PENNSYLVANIA.

A pamphlet having been issued purporting to be a report of a committee made at a special meeting of the Odontological Society of Pennsylvania, held November 1896, the publication and distribution of this said report being wholly unauthorized by the society before which it was read, the following resolution was at the Annual Meeting held May 8, 1897, unanimously adopted:

Resolved, That the Editor of the Proceedings, Dr. Jos. Head, be and is hereby authorized to publish in the *Dental Cosmos* and International Dental Journal (if possible) the statement that the Odontological Society of Pennsylvania authorized neither the publication nor the distribution of this said pamphlet, which purports to be a reprint from the Proceedings of the Odontological Society of Pennsylvania, November, 1896.

C. N. Peirce.

PENNSYLVANIA STATE DENTAL EXAMINING BOARD.

The Pennsylvania State Dental Examining Board will meet at the Glen Summit House, Glen Summit, Luzerne County, Pa., on Tuesday, July 6, 1897.

Henry Gerhart, Lewisburg, Pa.,
President.
J. C. Green, West Chester, Pa.,
Secretary.

PENNSYLVANIA STATE DENTAL SOCIETY.

The Twenty-ninth Annual Meeting of the Pennsylvania State Dental Society will be held at Glen Summit, Pa., on July 6, 7, and 8, 1897.

A full and interesting programme has been arranged and a cordial invitation is extended to all. Ticket-orders for reduced rates can be had over the following roads: Pennsylvania, Philadelphia and Reading, Lehigh Valley, and Central Railroad of New Jersey, by stating over which route you wish to travel and addressing

Dr. E. S. Jones, Bethlehem, Pa.,
Corresponding Secretary.

Otis Avery D.D.S.

THE

International Dental Journal.

Vol. XVIII. July, 1897. No. 7.

Original Communications.[1]

REMINISCENCES OF SIXTY-FOUR YEARS OF PRACTICE.[2]

BY OTIS AVERY, D.D.S., HONESDALE, PA.

Mr. Chairman and Gentlemen of the Convention,—I must beg the indulgence of this intelligent assemblage with regard to my remarks, inasmuch as they must, of necessity, be in a conversational manner of speaking, for the subject would not admit of anything oratorical, if I were capable of such, which I am not.

Having yielded to the wishes of a member of this Association to say something of the recollections of my earlier experiences in dentistry, allow me to say at the outset, that although I have had a busy life, it has been an uneventful one, and I never thought it worth while to keep any diary or memoranda of the occurrences. And, besides this, I am not a public speaker, and having been born in the first decade of this century, time has so impaired the vocal organs that it may be hard to understand what little I have to say.

In order to fully comprehend the character of the times, when dentistry had its advent, it would seem necessary to consider somewhat the condition of society and the trend of thought which moved the masses in the earlier years of this century, for we are living in a world altogether different from what it was then. I use

[1] The editor and publishers are not responsible for the views of authors of papers published in this department, nor for any claim to novelty, or otherwise, that may be made by them. No papers will be received for this department that have appeared in any other journal published in the country.

[2] Read before the Susquehanna Dental Association, at Carbondale, Pa., Wednesday, May 19, 1897.

the word *advent* advisedly with regard to dentistry, for, until the latter part of the last century and the first of this, the art was in its crudest form. The best they could do in supplying lost dentures was to fit a base plate and rivet to it teeth made from the tusk of the hippopotamus, neats teeth, or human teeth. Human teeth were most prized, notwithstanding they were procured by despoiling the dead. Even after the manufacture of porcelain teeth we were obliged to keep a stock of human teeth on hand to use as pivot-teeth for those who would have no other, because of their nearer match to natural ones.

Herodotus describes that the Egyptians confided the care of their teeth to a particular set of persons. But their operations must have been extremely limited and in no respect like that of the present day, for thousands of years may pass, and still the vast quantity of gold which already lies packed away in our cemeteries will assert itself.

At the risk of my remarks being considered rather irrelevant, I must state that in the earlier days of this century there was no mode of travelling upon land faster than a horse could get over the ground, and, of course, that regulated the speed by which intelligence was transmitted. Signals by semaphore were the only mode of telegraphy. Postage was regulated by the distance the letter was carried, and, in short, there was little of that intercommunication which exists at the present day,—little of the homogeneousness of society that we see now. There was, to a great extent, that exclusiveness which surrounds each little community, which is more or less marked in those who have had little communication with others.

The general awakening which took place at the beginning of this century must have had a cause. In dentistry the impulse could not have arisen solely from the mere fact that Billard [1], of France,

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[1] Dr. William H. Trueman, at our request, writes in regard to this as follows: "Billard is a late writer. I do not recall his name as in any way connected with the introduction of porcelain teeth. Nicholas Dubois de Chemant is generally credited with making them a practical success. The Faculty of Medicine in the University of Paris gave him a certificate for his invention, March 5, 1789, and the Paris Royal Academy of Science, after carefully considering the rival claims, awarded him its approval June 10, 1789, shortly after which, I think, he received a patent in England.

"Porcelain teeth were commercially made in Paris, single teeth to be soldered on plates, as early, at least, as 1817. That year the elder Plantou brought some over to America."—[Ed.]

had discovered that teeth could be made of porcelain, and this had been improved upon by the Americans; and what more likely than that the utilizing the force which was known to exist in heated water and making it do the work of animal muscle should become the first step in the march of material progress. When Watt harnessed that power to a pump, demonstrating its utility, there was a general wish to make the power locomotive. And when the legislature of New York offered the exclusive right to navigate the Hudson River to the first person who would make a steam-driven boat that would run at the rate of three miles an hour, against the current, there was a general scramble for the prize. Fulton, having, with the aid of Chancellor Livingston, procured an engine built in France, brought it to New York, put it in a boat, and asked some of his friends to accompany him on his trial trip. Incredible as it may seem at this day, some were ashamed to be known to look with favor on such a chimerical scheme. And when some of the machinery got out of order, making it necessary to stop the boat to rectify it, they gave strong expression of their disgust and wished themselves on shore. They little thought they had witnessed the inauguration of a giant whose voice would wake the nations; who, with one foot on the sea and the other on the land, would revolutionize the commerce of the world; whose scream would be heard on hill-top and valley, amid the crags of the Rockies and the far-off plains of the Pacific. It is characteristic of the masses, to oppose or sneer at any step in advance of what may be called the common thought. It is not so marked at this day, but still this tendency exists. There is now, however, a growing disposition not to be surprised at anything. I well remember when it was not so; when there was a general scepticism of everything new.

I remember a conversation on the subject of stenography, some ten years before Isaac Pitman published his system of phonetics. A young man suggested that a better system of short-hand would be to base it upon sound instead of the old way of abbreviations, and arbitrary signs for phrases, and memory, and the people laughed at him. One, who had been a teacher for many years, said the thing was impracticable, for it would be physically impossible to take down a speech verbatim. Somewhere in the forties I was in New York, and saw a notice that there would be an exhibition of a new system of short-hand as taught by Andrews and Boyle. I attended and found a moderately sized hall partly filled with gentlemen, a large black-board at one end and a lad with a chalk

crayon standing near it. The professor requested some one in the audience to read rather rapidly a paragraph from a newspaper. After the reading was finished the boy read what he had written, and, to the astonishment of the audience, it was verbatim as read from the newspaper. There it was; the impossible had been accomplished. And now the system is taken as a matter of course, for you find it in the busy marts of commerce, in the courts of justice, in religious assemblies, and public meetings, catching whatever falls from the speaker's lips on the point of a pencil and fastening it to paper.

So also it was with Daguerre. While struggling with the problem of how to fix the reflection of the sun's rays upon chloride of silver so as to form a picture, his friends became alarmed for his sanity, and called in experts to determine whether he was not following the phantom of a disordered brain. What is now the result? He has not only filled the world with beauty and gladness, but compelled the sun itself to deliver up secrets of being which could never have been known but for the camera.

Once more: Among my most vivid recollections is the change that was wrought by the construction of the Erie canal in the State of New York. There was a system of turnpikes from tide-water into the western portions of the newly settled country, a part of which was called the "Western Reserve,"—that portion of Ohio which Congress, just after the Revolutionary War, appropriated to the State of Connecticut to settle her claims on this part of Pennsylvania. These roads were teeming with emigrants going into that and adjacent States; and while living on one of these turnpikes I have heard the most blasphemous denunciations of the canal by those engaged in carrying produce and merchandise. The opposition ran so high that I believe, had the promoter (Governor Clinton) appeared among the people, he would have been mobbed for what was considered a waste of the public money upon a worthless ditch. But the canal was finished, and while it spoiled the turnpikes, it created an empire. And the sons and grandsons of these very men have, by popular vote, just decreed that millions more shall be expended on what their fathers termed "Clinton's worthless ditch."

I have cited these facts to try and throw a side-light upon those early times. In speaking of what I remember of the earlier days of dentistry I cannot, as I see, do better than give a narrative of my own experience, unpleasant as it is to speak in the first person and at the risk of being charged with egotism.

In the year 1833 I received my certificate of qualification to practise dentistry from my preceptor, Dr. D. C. Ambler, of Barclay Street, New York. You will bear in mind that at that time there was not a dental school in all the world, nor any institution where dentistry was taught. Neither was there a journal devoted to the art (for it was called an art in that day), and the only mode available for improvement was by comparing notes among several dentists, which was a kind of close corporation, keeping our several views within the charmed circle.

In that day the anæsthetic properties of sulphuric ether or chloroform were not known, and we were equally ignorant of all obtundents to relieve the pain of sensitive dentine. Our only recourse was to a keen excavator and keeping the cavity dry, which was sometimes very difficult to do, for we knew nothing of the rubber dam. Whenever we had a very severe case of sensitiveness we would fill the cavity with a pellet of cotton saturated with creosote and morphine, and dismiss the patient until the next day; but often when a patient submitted to a dental operation he would think he had fallen into the hands of the tormentors.

With regard to dental literature, you will often find now more practical information in one number of a leading dental journal of this day than all the dental literature of those days in the whole English language.

As it was at first supposed that each dentist would be obliged to make the teeth he used, it was a part of our education to manufacture them; and the apparatus for such purpose was no small part of the outlay in getting ready to practise. But four or five years cured us of that fallacy, as there is nothing in common between the high art of manufacturing porcelain teeth and the practice of our profession, or the skill in setting them.

While the demand produced the supply in a few years, at first we were obliged to make our own instruments, especially pluggers and excavators. Having furnished myself with what was then considered an ample outfit, composed, say, of a dozen of agate-handled pluggers and some four dozen mother-of-pearl handles with sockets for excavator-blades, all ferruled with gold and arranged in trays, they made a beautiful display; and having made them myself I felt justly proud of them. I took them to the town where I had lived some three or four years, and confidently expected to receive as liberal a support as a dentist as I had as a watchmaker and silversmith. But nobody seemed to be in want of my services in that line. I was a member of a religious denomination, and I asked a

member, with whom I was on intimate terms, to call and look at my instruments. After contemplating them a little time, I found he did not enthuse any and wondered what was the trouble. At last, with a sigh, he turned and said, "Brother Avery, do not you think you would be doing the public and yourself more good by throwing these things into the river and going back to your old trade?"

To say that I was astonished is putting it mildly. I saw at once that he took a view of the matter which I had never thought of; that there was a moral principle involved in the occupation of dentistry. The church then discountenanced personal adornment much more than it does at this day, and held that anything which tended to foster the pride of life was to be shunned, as from the evil one. I soon found that the matter had been discussed and settled, among those good men, that I was going straight to perdition, and that they must make an effort to prevent such a catastrophe; for another member called to argue the question, and among other things he said that practising dentistry was going against and in the face of Providence. And also that it was not a respectable calling. I cited to him the fact that the best of men did not hesitate, when their eyesight failed, to supplement it with glasses, nor was it considered going against Providence for a man who had lost a limb to have an artificial substitute. And as for the respectability of the calling, I would try and make it so, so far as I was concerned, with much more in the same line. But anything I could say went for nothing. Our church in the town was but a charge belonging to a circuit, with no resident minister; the preacher visiting us only once a week. But he, being an intelligent man, soon put a stop to any further action against me; otherwise I do not know but they would have considered me a subject for discipline. Yet they were good men, and I thought, "let the righteous smite me," etc. It stirred up, however, an opposition to me such as they little expected. I had been somewhat active in our social meetings, and there was a class that looked with delight upon what they considered my fall and repudiation by the church. They "always knew I was a scoundrel," and "were not surprised that I should show it when it was my interest to do so." All of which I let pass; but when they ventured to charge me with crime, rather than be called to answer before a court, they were willing to acknowledge the charge malicious and false.

Finding I should get nothing to do in that neighborhood, with such a feeling against me, I determined—was compelled—to find some one who knew what dentistry was, and I started on my

travels. I went from town to town by such conveyance as offered or could be procured. On my arrival at a place I would send a boy out with my card, stating that I could be consulted and would be happy to attend upon any who should need my services as a dentist, either at the hotel or at their residences. Then came an anxious waiting. I would display my instruments so they could be seen, and sometimes there would be half a dozen young fellows in to stare at me and gaze at the instruments. I never was very self-asserting, and that fact may have had something to do with it. But they seldom spoke to me, and I had too much self-respect to make a personal application for their patronage; though I maintained a sociable and friendly manner. Thus it was, day after day, in different towns and hamlets until I became heart-sick.

It seemed as though there was a conspiracy against me, for nobody wanted my services or seemed to know what dentistry was; they seemed to think my instruments were simply to look at. But at one place where I stopped, when they were looking at and talking about them (they had found that I had made them), one of the company said, "I do not know what them tools are for, but this I do know, that a man who could make them knows how to use them." He was the first to grasp my motive in displaying them. With half a mind to give up the struggle and turn back, I felt as a man must feel who had expended all that he had and could borrow on a cargo of goods which nobody wanted, or would take as a gift. I was convinced of the fact that some had looked at the matter as a show; as, when I stopped at one place, which was nothing more than a hamlet, I found a crowd with an air of expectancy standing around, and as I stepped into the tavern the landlord said, "Your things have not come yet." It appeared that some wag had told them there was a show coming and to look out for it. As soon as we could feed the horse we drove to the next town, leaving them in expectation of a harlequin with his Punch and Judy. At another time I had employed a man to take me from a town, and after we had started he said to me, in a confidential tone, "How's business?" "Not much," I answered. "Oh, now," he replied, "you needn't say that, for you folks always pretend you have made nothing. I know one fellow who made a big swag about six months ago." "How did he make it?" I asked. "Why with his roulette," said he. I replied, "I am not in that business." "What business are you in?" he asked. "Dentistry," said I. He gave a snort of disgust, as much as to say, "I thought you were a gambler, but you are nothing but a dentist."

I had started out full of hope and expectation, but here I was with my money nearly all spent, and from an optimist I had become an inveterate pessimist, disgusted with myself and my surroundings. In this state I arrived at a town where I had been known when a boy, though I had never lived there, and sent out my cards, and was debating whether I should give up the struggle and take the next stage for home when there came a message from a wealthy Irish family in the neighborhood, requesting me to call at their house with my instruments. I found they were well versed in dentistry of the old style, but when the lady found that the base plate was made of gold, with porcelain teeth soldered on it, instead of an ivory plate with the teeth riveted to it, she immediately ordered an upper set. The younger branch of the family consisted of a son and his wife. Their teeth had been kept well filled. The wife, I found, was the prime mover in calling me to visit them. She insisted on her husband having his teeth cleaned, and tried in every way to find something for me to do so as to make a bill. Now it has always been a query with me whether it was not sheer compassion which induced her to have me call at their house; for, by some means, they had heard of my being in other places and how I had been received. At any rate, I have always since liked the Irish and kept for them a warm place in my heart, for they were the first to offer me any encouragement and kindly advice. I had hardly taken an impression before it was noised about town that Mrs. Penderghast was going to have a false set of teeth put in her mouth. While I was much elated, I tried to maintain my equanimity as though the ordering of a fifty dollar set of teeth was an every-day occurrence. Yet the sky looked brighter, the birds sang sweeter, and my feet took a more elastic spring. Hope returned and I decided to go on to Utica, where there was only a dentist and a half, for one of them divided his time between shaving his customers and extracting their teeth, with phlebotomy incidentally added. I found whom I intended to call on, and, fortunately for me, they were in want of my services, and they advised their friends to employ me for what dentistry they needed, so that I was amply paid for my visit there.

They urged me to open an office in the city, and I went so far as to look for suitable rooms, to be ready, if, on consulting my wife, we should conclude to take them. She had been kept advised of the condition of things, which had resulted in no money till I got to Utica, except the little produced by extracting a few teeth, and that generally caused an altercation, because I charged a shilling,

whereas the doctors would charge only sixpence for extracting. She said my mistake was in going north instead of south; that if I had gone among the *bandits* of the Beech Woods I must certainly have succeeded. The term she used needs some explanation. Soon after we had moved to New Berlin we were at a social evening party, where a lady told of a visit of a friend who had travelled all the way from Philadelphia with their own conveyance, and their route necessitated their travelling through the Beech Woods of Pennsylvania, which was filled with all sorts of wild beasts, such as wolves, bears, and other ferocious animals, with men more savage and dangerous still, who made those woods their haunts. They were in constant fear for their lives, as they often saw men with guns and axes prowling around in the bushes; that they actually saw where one murder had been committed, marked by a pile of stones by the side of the road, with a lot of other trash of the same kind. After she had finished, the company sat spell-bound with horror and almost breathless to think there was such an awful place in this country. After a little my wife said, "Well, I was born and brought up in the Beech Woods and educated in the Beech Woods Academy, at Bethany, and never in all my life heard such stuff as that about my native county." The effect was electrical. If a native of the Feejee Islands had dropped down among them they would hardly have been more surprised, for here was a denizen of that terrible place sitting in their midst clothed and in her right mind. The lady, however, was not disposed to give it all up, so, turning to me, said there certainly was a murder committed, as she saw the pile of stones which marked the place. "Yes," I replied, "but both the murderer and his victim belonged in the State of New York, and all that the people of the Beech Woods had to do in the matter was to hang the murderer in accordance with the law."

Coming back to Wayne County as a dentist to my friends in Bethany (which still was the county seat), who knew me as having been the first to establish a watch-making and silversmith-shop in the county, they received me cordially, showing no intimation that they thought I had done anything reprehensible by becoming a dentist. Thus was my itinerary established, reaching from this point north to the Mohawk Valley, more than a hundred miles in length, and taking in most of the towns within twenty miles on each side. Except at Binghamton there was not, in all that region, a resident dentist. I soon found it necessary to drive my own conveyance to economize time, for as soon as I had finished the operations re-

quired and taken such impression as offered in one town, I started for the next, whether it was in the daytime or at night. In fact most of my travelling was at night. I would send out my cards, wait one day, and if nothing offered, after supper would start for the next place. Whenever the amount of business in a town fell to less than five dollars a day I started on my travels. By such means those wanting anything done were sure to be on hand. Sometimes there would be a general scramble for chances. All the mechanical work was done at home, so this and the manufacture of teeth took up all my time.

In that day there were men who had been eminent preachers in their prime, but were stranded,—silenced as much as if by decree of Conference or Synod because of their inability to pronounce many words of our language, made up as it is so largely of dental sounds. When they began to preach again, to their own delight and the edification of the public, my conscientious brethren admitted that dentistry was not altogether bad; that false teeth might be a help in speaking, but that was all; they were only good for that, but of no service in eating. I had put in a set of teeth for a physician of more than local repute, who, when bantered by a lady for being so proud as to have artificial teeth, which could be of no use to eat with, said to her, "Put your finger in my mouth and see whether they are all for looks." She did not want to repeat the experiment, certainly not until her finger healed. These things seem very trivial now, but at that time it was as much of a curiosity as the telephone was on its first introduction.

Thus we plodded on, discussing various problems, "in pursuit of knowledge under difficulties," when now and then there would start up, for example, a genius who knew it all and would deliver himself of such flashes of wisdom as this: "That as the decayed part of the tooth was always softer than the other portion, there was no sense in making so much ado about the temper of the excavators. It was only necessary to take a piece of steel wire, bend it to the shape wanted, then file it to an edge, and there you are."

Gentlemen of the Association, you are to be congratulated on being in the midst of a movement and growth of the profession which is truly phenomenal, and which is far-reaching in its beneficence, not only adding hundreds of years to the sum of human life, but making that life enjoyable through the practice of your profession, a profession which has already arrived at such a stage that the old name does not now express its full significance and

scope. Who, then, dare guess what another three-quarters of a century will bring forth, as others shall take up the science as it will be when you lay it down. Considering what has already been accomplished we may reverently adopt the saying, "What hath God wrought?"

One word to the younger members of this Association with regard to what I have learned to be the best attitude to assume in relation to the practice of our profession. For a higher system of ethics you must look elsewhere. Be temperate in all things. You will find its advantage in steadiness of the nerves. Do not worry, for there is a higher power than you who will make all things even. Eliminate from your dental vocabulary the word *can't*, for you do not know what you can do until you try. When you go upon a vacation (for, if you have had anything like a full practice and have used your brains with your work, you will need rest), leave the shop behind, for if you take it with you it would be just as well to stay at home. Be honest both to yourself and to your patient. Humor their idiosyncrasies, as far as possible; you will find it the best policy. In all your work, whether at the chair or in the laboratory, bear in mind the sentiment involved in the answer of the heathen sculptor, who, when asked why he devoted so much skill and labor in finishing the back part of the statues he was preparing for a Grecian temple, as when placed in their niches nobody could see that side, replied, "The gods see them on all sides."

A CHAPTER IN DENTAL HISTORY AND BIBLIOGRAPHY.[1]

BY WILLIAM H. TRUEMAN, D.D.S., PHILADELPHIA.

Having been apprised of the fact that Dr. Kirk would give us to-night a *résumé* of Dr. Williams's work, exhibiting the latest achievements in the microscopic study of tooth-structure and of tooth-destruction by caries, I thought it might be of interest to take a glance backward, and have brought with me the works of Alexander Nasmyth, who was, I think I may safely say, the first of our profession to earnestly take up this line of investigation. Early in the thirties he began, as all careful and methodic investigators should, by first collecting, collating, and critically comparing

[1] Read before the Academy of Stomatology, Philadelphia, March 23, 1897.

all the accessible works of those who had preceded him, and thus made himself master of that which the world knew in this selected field. His industry and thoroughness in this preparatory work is commendable and well worthy of imitation. I show you a copy of Serres's work,[1] once the property of Mr. Nasmyth, with notes and pencillings made by him while prosecuting this study. The first results of his labors are embodied in this volume, "The Historic Introduction to Nasmyth's Researches on the Development, Structure, and Diseases of the Teeth," published in London in 1839. Its perusal will be a revelation to any one who imagines that dental literature prior to that date did not amount to much. Both in quantity and value it was such that no profession, however exalted, need hesitate to acknowledge it. I would that it were more accessible and better known.

Next, we have the beginning of his original work, this little volume of some sixty pages with nine plates, his "Three Memoirs on the Development and Structure of the Teeth and Epithelium," published in 1841; and lastly this, Nasmyth's "Researches on the Development, Structure, and Diseases of the Teeth," published in London in 1849, the conclusion of his labors, the manuscript of which he had barely completed when he was suddenly, in the midst of his usefulness, stricken down and incapacitated for labor. Valuable as this work is, it would undoubtedly have been more so had he been spared to superintend its publication.

These three volumes, the life work of Alexander Nasmyth, which has made the demonstration of this evening possible, were the beginning. The work of Dr. Williams shown us to-night by Dr. Kirk is the highest point so far reached as the result of sixty-five years earnest, continuous work of many enthusiastic laborers, who at every stage brought to bear the best that science and skill of the hour afforded in solving the mystery of tooth-building and tooth-destruction. In passing we may note for a moment that Nasmyth's time and Nasmyth's work may serve as a dividing line between the time when much that was accepted as truth rested upon theory alone, and the time when, as Nasmyth remarks, the advance in optical science rendered demonstration possible. Very early in his investigations Mr. Nasmyth was compelled to halt. The best microscopes and microscopic accessories attainable he found far too crude for the delicate work he had in hand. Enlisting the aid of expert opticians, partly by his suggestion and partly by his own mechanical

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[1] L'Anatomie et la Physiologie des Dents, par A. Serres, Paris, 1817.

skill, he initiated a series of improvements which has made the microscope of to-day the marvellously precise instrument it is.

Eustachius wrote in the little book we examined together a few months ago, published at Venice in 1563, that if the germs of the permanent teeth are not seen in the fœtus, it is not that they do not exist, but that they are too small to be recognized. The microscope has enabled us to see with the eye that which this learned writer saw only in mind. Again, John Fuller, on page 55 of this little volume, "A Popular Essay on the Structure, Formation, and Management of Teeth," London, 1810, a work which, judging from the frequency it is referred to by his contemporaries, was held in high repute in the long ago, while discussing the phenomena of tooth-decay and its causation by some acidity of the surrounding fluids, cautiously suggests that the reason why it attacks certain spots in preference to others equally exposed, may be due to some congenital modifications of tooth tissue at that particular point. This haltingly made suggestion, Dr. Williams eighty-six years later demonstrated to be correct.

How slow, even in this progressive age, is real progress. It took some forty or fifty years of well-directed microscopic work to solve the mystery of dental caries. Nearly a decade and a half has elapsed since Dr. Miller announced that dental caries was the result of microbic energy, the initial stage, however, baffled his keenest scrutiny. Dr. Williams, by steady and patient work during the intervening years, aided by the improved facilities advancing science has supplied, seems to have completed the work, and we may now, for the first time in the history of our science, say that this riddle of the ages has been solved. So far, however, the stumbling block to the practical application of this discovery still remains. It seemed easy, after the discovery was made, to *prevent* instead of *repair* the ravages of dental caries. You may remember that Dr. Miller, and others, earnestly and hopefully began work to compass this desired object, only to find that an efficient germicide was also an equally efficient homicide. So long as this is the case, prevention remains a dream.

While we are looking backward permit me to call your attention to two other books I have with me. First, a well-preserved, handsomely bound copy of the "Elements of Odontology," by M. Lecluse, a surgeon dentist of Paris, dated 1754. Lecluse was a dental writer of well-deserved repute. This volume contains two of his works; the first is mainly upon the anatomy of the mouth and its surroundings, touching briefly upon some diseases of the gums and teeth.

I particularly call your attention to the second plate, page 131, representing three instruments devised by him for removing deposits from the teeth, especially a double-ended one, one end shaped for a push cut and the other for a draw cut. They are quite unlike the cumbersome instruments for this purpose so frequently figured in dental books. I have no doubt but that these instruments, devised by Lecluse nearly a century and a half ago, for delicacy and convenience would fully meet the approval of the most exacting of to-day, while his directions for performing the operation of cleaning the teeth, so far as the mechanical part is concerned, leaves little to be desired. Bound with it is a work he wrote a few years before, intended for the use of the public, on first and second dentition. It had been so well received both by the public and his professional brethren, he tells us, that to extend its usefulness he has included it in this work, intended mainly for professional readers. A careful study of dental literature fails to confirm the idea, so often expressed, that our profession has been remiss in the matter of instructing the masses in the care of the teeth.

This little work by Lecluse is but one of hundreds written by dentists with that object in view. To emphasize that fact I show you a copy of the very oldest dental publication at present known, possibly the only one in existence of so early a date, printed at Meyng, by Peter Jordan, August, 1532. It is entitled "Zene Arzney," and is a beautiful, well-preserved specimen of the antique German. Its scope and character is well shown by the title-page, translated as follows: "Teeth Medicine: against all kinds of defects and diseases of the teeth; many wholesome and well tried medicines extracted out of the books of Galen, Avicenna, Mesue, Cornelius Celsus, Pliny, and others; together with compendious and useful instructions as to how one can keep his teeth healthy, and how one can extract the bad hollow teeth, or their roots, which get to paining easily." A translation of a later edition will be found in the *Dental Cosmos*, vol. xxix., January, 1887, p. 1, and on page 68 of the same will be found a history of the copy there translated. In that history it is stated that when Mr. Crowley compiled his dental bibliography, in 1885, the only information of this book was a reference to it in a German medical journal issued about one hundred years ago, giving the date 1536, and place of publication Frankfurt. Shortly after the publication of Crowley's work a copy was found, and became the property of the *Dental Cosmos*. This was printed by Christian Egenolff, at the Leather Breeches (Ledderhosen), Frankfurt, 1541. The copy I show you bears the imprint of Peter

Jordan, at the "Leather Breeches," Meyng, 1532, nine years earlier, and Crowley's No. 15 is, I think, another edition under a somewhat different title, dated at Erfurt, 1614. In the Index Catalogue of the Army Medical Library at Washington, vol. xvi. p. 766, 1895, is noted a reprint, in 1891, by C. Weigler, of Berlin, of the little book I show you. So much for its history. For the contents I refer you to the translation in the *Dental Cosmos*, it is well worth reading, and old as it is may furnish a model for those who propose a series of popular treatises upon dentistry for the Sunday newspapers. The last admonition, if properly emphasized, might tend to make them popular,—"And finally, after eating, always wash the mouth with wine or beer." Further than it refers to filling cavities of decay with gold leaf, and thus carries back the use of gold for this purpose to at least 1532, this little book has value only as a curio, and as a well-preserved specimen of typographic art as it was three hundred and sixty-five years ago. It belongs to a class of publications of that period and later, of which a few specimens survive, devoted to matters of health and the toilet. Jordan and Egenolff were printers or publishers, not writers; the later name I find in connection with another work of a similar character, in Latin, of nearly the same date. In conclusion, from 1532 down to 1897, there never has been a time when publications giving popular instruction for care of the teeth were not accessible to the public; many of them have been well written, and, on a whole, in my judgment, those that I have seen compare favorably with the best of their time in any science or in any art.

THOUGHTS ON REGULATING.[1]

BY HOWARD E. ROBERTS, D.D.S., PHILADELPHIA.

Mr. President and Gentlemen,—My excuse for writing this paper, if an excuse is necessary, is that I was asked to do so.

My reason for taking this subject is that I believe I correct irregularities somewhat differently from the majority, and with results gratifying to myself and apparently satisfactory to my patient. When I say gratifying to myself, I mean that I accomplish that which I attempt with the least worry about keeping things in place and without the necessity of having a laboratory

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[1] Read before the Academy of Stomatology, Philadelphia, March 23, 1897.

handy. Satisfactory to my patient because there is the least amount of suffering with the greatest amount of comfort possible while going through an uncomfortable operation.

Apart from the annoyance of having the teeth sore, a great deal of irritation and worry is caused when anything is placed within the arch that either interferes with the free use of the tongue in talking or eating or that the tongue can play with or move. The patient is continually under a nervous strain and " mole hills seem like mountains," therefore I keep my appliances as much as possible upon the labial surfaces of the teeth.

Another great source of irritation comes from ligatures or bands either pressing against the gum or slipping out of place and working up around the neck of the tooth, therefore I see that it is impossible for them to get out of place. Keep things out of the way of the tongue and ligatures and everything else from touching the gum, and you have gone a long way towards making regulating bearable to the patient.

It seems almost unnecessary to say that all appliances should be made as small as possible. The appliances for nine-tenths of the cases of irregularity which are presented for correction can be made at the chair, and the only special instrument necessary is a jeweler's jam-plate for cutting threads. The jam-plate is not made mechanically to cut a thread, but, as its name implies, to jam or indent a thread upon a wire. It will do its work nicely and easily if care is taken to make the wire square where the thread is to be cut; to jam a thread upon a round wire is sometimes difficult.

A set of dies and taps can be procured, if it be desired, which will cut a thread perfectly; the wire or pin must be round, or nearly so, where these are used, and not square as in using the jam-plate.

In this set of four dies which I use the threads run 80, 100, 120, and 140 to the inch, and the one most used is 100. You can see the size of the wire upon which the thread is cut. With the dies there come taps to match. In using the jam-plate I make the tap I need from an old excavator.

I can best describe my mode of treatment by taking a case in practice, and have selected one where the teeth are somewhat jumbled. I do not attempt to do the work rapidly, but as comfortably as possible. In this case the corrected upper jaw is not a perfect arch, as the patient's parents did not care to carry it further, and the left lateral is a malformed tooth.

When this case was first presented an impression was taken in modelling compound of both jaws so as to show not only the teeth,

but the gums over the roots of the teeth. I have never found it necessary to take the impression in plaster, and it would seem to be a waste of time. Always date and preserve the casts of the teeth as they are, before starting to make the correction, and study them carefully before going further or giving any advice.

An engagement was made on April 20 to make and put in place the appliance on the upper jaw. Previous to the patient coming, I provided a piece of platinum plate of thirty-two gauge to make bands from and a piece of half-round platinized gold wire which would reach from the first bicuspid on one side to the corresponding tooth on the other when resting upon the labial surface of the teeth, this made a spring bow. The ends were filed square for about three-eighths of an inch and threads were cut upon them with the jam-plate. To make the little nuts for the screw ends of the bow, the temper was drawn from an old excavator, the end filed square and the same thread was cut upon it, when it was re-tempered to a straw color; this made the tap. Holes were then drilled through a piece of heavy gold plate and tapped; small pieces were cut from the plate having the tapped holes in their centre, these were again run upon the tap to hold them and filed square, making them as small as possible for strength. This bow was made before the patient came. The canines required spreading, and with the patient in the chair a strip of platinum was cut one-eighth inch wide and three-eighths inch longer than the circumference of the tooth, bent in the form of a U and forced between the adjoining teeth and the canine with the ends out. With the finger hold the piece firmly against the palatine surface, then with flat-nosed pliers, which are smooth in the beak, grasp the two projecting ends, and, bearing upon the face of the tooth, close the pliers firmly, when you will produce a band closely fitting the tooth with the ends projecting at right angles, the bend being sharp and square. Cut one end off one-eighth inch from the band and the other one-fourth inch, bend the longer sharp, to fold over the shorter end and squeeze with the pliers, which clamps the ends together. Put a piece of pure gold over the joint inside the band and flow until the lap is thoroughly soldered. The annealing lamp will give heat enough. A band is thus made having a stout lug upon the face, through which drill a hole large enough to pass the end of the bow freely and file or grind away the excess of material to make a finished band and loop. This band was cemented to one canine and a similar band was made and fastened to the other.

The nuts being in place upon the bow, it is sprung into the bands

and should rest upon the face of the most prominent incisor, which was ligated firmly to the bow and the nuts screwed against the loops on the bands; this was allowed to rest quietly for three or four days to allow the patient to become accustomed to it, after that the other incisors were either ligated to the bow or were drawn to it with rubber bands and the nuts were kept tight against the bands on the canines. On April 28 the same kind of an appliance was placed upon the lower jaw and both jaws straightened at the same time. I saw the patient nearly every day from that time until May 23, when she left the city; afterwards I saw her on June 10, 16, 26, and 27, July 10, 11, and 13, on which date I placed retaining bands on both upper and lower teeth, less than three months from the start, and the total time devoted to the case was twenty-nine hours. At no time did she complain of the pain, her gums were never inflamed, and she always came in smiling and seemed rather to enjoy the operation, as she was interested in it.

I have straightened teeth in the mouths of patients from seven years to forty years of age, and for ease and comfort I would take from fourteen to seventeen years, older rather than younger, and if a case is presented with the canines not erupted, as a rule, I would say wait until I can get bands upon them. If both parents and patient are not anxious to have the teeth put in place and be willing to assist and give the time to it, I would also say wait, they will probably want it done later when it will be easier for all, and particularly for the dentist. If asked how long it will take, I double the time I suppose will be necessary, and tell them that long; it is better to be through sooner than to take longer than they expect.

I believe a mistake is frequently made in thinking a case too easy and proper appliances are not made, the result being disappointment and failure.

In putting a bow in place it should rest naturally over the teeth near the gum and not spring towards the cutting edge; if it does, the tooth to which it is ligated may be elongated. If the ligature has a tendency to work off the tooth, drawing the bow down, make a band for the central and file a notch in the projecting lug, into which the bow will drop, and cement it to the tooth. To keep a rubber band or ligature from getting out of place, cement a platinum band near the tip of the tooth and tie the ligature just above the band; the band keeps it from slipping off and the tooth is larger above so that they cannot work up.

To make a band with a hook, over which to slip a rubber band or ligature, bend the lug over and file into shape. No metal band

should be placed around a tooth without being thoroughly cemented. When a nut works loose, a ligature around the bow, over the nut, and hooped over the end of the bow and tied, will keep it in place.

I use the force of the screw, the spring of the bow, the elastic band, and the stress of a ligature tied tight all at once, or one at a time, as seems most desirable. It seems difficult to give good working advice, about a case from looking at the casts, because each case has an individuality of its own. The patient should be seen and known, and the ability of the dentist to carry out suggestions should also be taken into account.

For remuneration, I prefer to keep a record of all time spent upon a case and charge by the hour.

I do not like piano-wire for springs, or silver or German-silver appliances; they are unsightly; gold and platinum for a case does not cost much and are very much nicer.

I have found the vulcanite plate in the roof of the mouth an excellent thing upon which to become proficient in the use of profane language.

DEFECTIVE ARTICULATION ACCOMPANIED BY PAIN CORRECTED BY OPENING THE BITE AND THE INSERTION OF IMMOVABLE BRIDGES.[1]

BY J. G. BRIGIOTTI,[2] PARIS, FRANCE.

I WAS called upon a year ago to attend a distinguished clergyman, who had the singular habit of moving his jaw from side to side, and forward and backward, until he had worn down his few remaining teeth nearly to the level of the gum.

There were only left in the upper maxillary three incisors, one canine on the left side, and two sixth-year molars.

In the lower jaw there were four incisors, two canines, one left bicuspid, and two twelfth-year molars.

All these teeth, or rather their ruins, were in the most deplorable condition, and the patient suffered much pain, as already intimated.

The conditions can be seen in the model which I have the honor to present to the Institute.

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[1] Read at the meeting of The New York Institute of Stomatology, March, 1897.

[2] Professor at the École Odontotechnique de Paris.

As can be readily understood, my patient had great difficulty in masticating his food, and his health had suffered greatly in consequence of this defective mastication.

Such was his condition when he first called upon me.

After having examined this interesting case, I determined to make use of the dental remains which I have described above, by adapting to them a strong and immovable apparatus which should enable my patient not only to resume his profession of preaching, but to masticate satisfactorily.

Fearing that a removable apparatus might rather increase than diminish the habit which he had contracted of grinding his teeth, I applied a fixed apparatus, which proved very useful to him and with which we are both perfectly satisfied.

As the two upper molars had no antagonists, there was consequently a tendency to use the forward and backward motion of the lower jaw, which eventually resulted in the projection of the jaw already mentioned.

To correct this defect I thought it would be practicable and advisable to open the bite. To this end I fitted caps to two teeth on each side of the lower jaw and fitted artificial teeth into the spaces between the caps, soldering all together.

These fixtures were then firmly cemented to the teeth. The spaces below were in this way completely filled. After inserting this appliance I waited a fortnight to judge of results and to assure myself as to whether the patient was going to be able to tolerate the new conditions. He seemed quite contented and experienced no inconvenience from the apparatus.

I then proceeded to the second operation. Instead of making a single fixture, I made two separate ones, so as to facilitate repairs should any ever be necessary.

I placed half-caps around the worn incisors, as well as around the cuspid, and two entire caps upon the molars at either side, held firmly together by a gold plate to which they were soldered.

All intervening spaces were then filled by soldering artificial teeth or crowns to these gold plates. These in their turn were cemented to place.

I saw the gentleman three months ago; he was delighted with the result of our work, and had been masticating with so much energy that I was obliged to insert gold fillings into the worn caps.

By comparing the two photographs which I have the honor to present beneath, one can realize the change that has been made. The upper jaw, instead of seeming to be sunken, has resumed its

proper relation towards the lower teeth. The articulation seems good at every point and even better than it was originally.

I have taken the liberty of bringing this case to the attention of the Institute, and shall consider myself honored if I have been able to excite interest in the minds of the members.

SOME DENTAL MANIFESTATIONS OF GOUT.[1]

BY J. S. GILLIAMS, M.D., D.D.S., PHILADELPHIA.

Any one familiar with the dental practice of thirty years ago will remember that occasionally the falling out of the teeth was said to be due to the gouty condition.

The cases in which this disease was observed were those which had a clear and direct family history of gout, the loss of the teeth mentioned as a possible effect of the constitutional disease.

The dental disorder called Rigg's disease was then, as it is now, regarded by many as purely local trouble. No one appears to search for a constitutional disease as an underlying cause. Some of the older books on dentistry and others on general medicine did hint at gout as a cause of dental periostitis, but not explicitly enough to make the connection between the two clear.

Such teeth were then, as now, suffered to be lost by the progress of the disease. Faint-hearted attempts at saving them were made by the use of clumsy scalers; the larger and visible deposits of tartar were removed and tincture of iodine applied to the gums and around the necks of the teeth. Occasionally a case would recover through this treatment, but usually the teeth were lost one by one.

In my own experience, it is only within the past score of years or so that any great number of patients suffering from this disorder have sought the services of the dentist with any hope of cure.

Most patients, as the teeth are lost by this disease, appear to suffer but little from dental caries, and were content to submit to the gradual loss of these organs, until a sufficient number were destroyed to demand replacement by artificial teeth, either for appearance or to increase the lessened masticating surface.

This type of cases presented to the dentist with the remaining teeth loose and the connecting and adjacent tissues soft and

[1] Read before the Academy of Stomatology, Philadelphia, March 23, 1897.

flabby has been due to pyorrhœa. This condition of the mucous membrane has been present after the loss of all the teeth, and there is left a flat mouth, covered by a more or less loose and flabby mass of soft tissues. The loss of the alveolar walls has destroyed the ridge of the arch, and the inflammation of the soft tissues has left a congested-looking mass, making a poor base for the support of a plate and teeth.

For some years I have noticed that patients who knew they had gout or rheumatism would complain of pain in or about one or more teeth whenever it happened they had an attack of the constitutional disease. Some of the teeth, in fact most of them, pointed out by the patient as being the seat of pain, would have no signs of caries, and no increased response to heat or cold. There would be some sensitiveness upon pressing or striking the tooth, but no marked signs of inflammation over the root. Occasionally the dental periosteum inflames, but rarely running on to abscess. Some persons having these symptoms, and who happened to be under treatment for gout or rheumatism, would have the dental disease disappear when the constitutional disease was cured.

Since the publications of Professor Peirce's essay and those of Drs. Kirk, Darby, and Burchard, I have examined more carefully the diseased teeth of persons known to have gout, rheumatic gout, or rheumatism. In all three of these diseases the teeth have been noticed to have pyorrhœa in some, erosion in others, and all of them have been singularly free from decay. The teeth are usually the kind which appear to resist the causes of dental caries.

Besides the cases which are certainly gouty or rheumatic, there are others who have other general disorders diagnosed by their physicians, and who have pyorrhœa; the most common of these diseases is chronic dyspepsia. Many of the pyorrhœa cases in men are those addicted to the use of spirits, and others are champagne drinkers; many are gourmands. Others have, according to the testimony of their physicians, kidney or liver disorders.

The local appearances are so much alike in many of these cases that I am convinced, despite the diagnosis, that they would be found to belong to the gout family.

A number of patients who have never had an outbreak of acute gout or rheumatism will exhibit, upon close examination, some enlargement of one or more of the small joints, indicating gout or rheumatic gout which has not been diagnosed.

I have noted two interesting cases which will show the dental disorders which may attend the gouty or rheumatic condition.

This first is that of a lady, aged about sixty years; five or six years ago she complained of an uneasiness in or about a lower wisdom-tooth. It was slightly sensitive to heat and cold, a little more to the heat than to the cold, I thought, and was a little sore to pressure or percussion. A beginning abscess of the pulp was diagnosed, and a broad gold filling which was in the masticating surface of the tooth was removed. The cavity was found not deep, the dentine hard, and the sensitiveness normal. The cavity walls were bathed with carbolic acid and oil of winter-green, and filled with cement. My friend, Dr. Burchard, saw the case and, after questioning the patient closely, diagnosed it as probably a local expression of rheumatism or gout, very probably the latter, and referred her to her physician, who placed her upon treatment for obscure gout; her general discomfort vanished and so did the dental trouble. Since then she has had one or two attacks of gouty trouble, and the dental disease broke out again and disappeared with the cure of her gout.

The next case is the one reported at a meeting of this Academy in 1896.

A lady of middle age, who had well-formed teeth and but little caries, complained of pain and swelling over two front teeth. These teeth had no cavities and had live pulps. The only cause of trouble seemed to be that they struck the lower teeth a trifle too hard. The tips of the lower teeth were ground off, the gum painted with iodine and aconite, and in a few days the pain disappeared. After a time she called again and then had swellings over these roots; between the swellings and the necks of the teeth the gum appeared to be healthy, and there were no deposits under the edge of the gum.

The patient has a family history of rheumatism; her sister having been a rheumatic, and had lost teeth by this variety of exfoliation. Tartarlithine was prescribed, and the inflammation subsided. In a few weeks she returned, and the swellings looked like abscesses; at the same time she complained of pain in some of her muscles. The swellings were opened and the process found partially destroyed, but there did not appear to be any deposits. With the cure of the rheumatism the dental trouble ceased. The loss of process is gradual and the teeth are getting looser, but the antigout treatment seems to retard the loss.

A third case is that of a physician who had lost several teeth by the process described by Dr. G. V. Black, in the "American System of Dentistry," as phagedenic pericementitis. These attacks occur

after he has had trouble with his liver. He says he has never had gout, but he exhibits all of the indications of a person suffering from faulty elimination of waste products.

Abstracts and Translations.

FORMALDEHYDE.

In the *Medical Chronicle* for December, 1896, Leech gives an interesting summary of the therapeutic possibilities of formaldehyde. Formic aldehyde (CH_2O) is produced when by means of a specially constructed lamp the vapor of methyl alcohol (CH_3OH) is passed over an incandescent platinum hood or mantle. The following formula represents the reaction: $CH_4O + O = CH_2O + H_2O$. For some time past a solution of formaldehyde in water of a strength of forty per cent. has been on the market under the name of formol or formalin.

Mosso and Paoletti find that formalin has a bacterial action almost equal to that of corrosive sublimate, while it is much less toxic. One part in 20,000 is sufficient to slow the ammoniacal fermentation of urine, and 1 in 4000 inhibits it altogether. Formalin hinders the coagulation of albumen by heat, but hastens the clotting of blood. It has little influence on the frog's heart, unless in solutions over one per cent. in strength. Very small doses, however, are sufficient to raise the blood-pressure and markedly affect respiration. Doses exceeding one cubic centimetre per kilo of body weight quickly cause death; doses of 0.1 cubic centimetre are poisonous if introduced into the circulation; and even smaller doses produce marked symptoms of irritation. A powerful action on the nervous system is shown, resulting in convulsions, analgesia, and lowering of temperature.

Formaldehyde has been found very useful in pathological work for hardening microscopic preparations and museum specimens. Orth has recently pointed out the value of formalin in this connection.

Several observers have experimented with formaldehyde in the disinfection of rooms. Some of the more recent papers are those

of Roux, Trillat, Pfuhl, and Hebert. Opinion is divided as to the practical value of formaldehyde for this purpose.

Horton considers formalin particularly suitable for the disinfection of books, as the vapor is not detrimental in any way to them, while it is very rapid in its disinfectant action. The effect produced during the first fifteen minutes is practically as great as that after twenty-four hours' exposure. He found that in a closed space books can be thoroughly disinfected by using one cubic centimetre of commercial formalin to three hundred cubic centimetres of air.

Turning to the therapeutic uses of the drug, Schleich found that when a watery solution of gelatin is allowed to dry in formalin vapor the chemical characteristics of the gelatin are altered. It is no longer affected by hot or cold water, nor by acids or alkalies. Animal tissues, however, have the power of breaking up the combination and setting the formalin free. It was also found that when the formalin gelatin, ground to a fine powder and mixed with cultures of various forms of pathogenic bacteria, was introduced into animals the bacteria did not develop, and the wounds healed without trouble.

Schleich states that with this formalin gelatin powder every acute suppuration can be stopped in twenty-four hours, and wounds made to heal aseptically. He has used it in one hundred and twenty cases of acute suppurative processes, in ninety-three aseptic wounds, four compound fractures, and two deep scalp wounds. The wounds were only cleansed mechanically, and then thoroughly rubbed with the powder. In fresh wounds the powder formed with the blood a quite dry and firm scab in a few hours.

In cases of necrotic masses, in old ulcers, etc., the powder had very little effect, but it was found that it could be digested with a pepsin hydrochloric acid solution (5 parts of pepsin and 0.3 of hydrochloric acid in 100 parts of water). The formalin gelatin powder is dusted on the wound, and then covered with a dressing wet with the pepsin solution, and the digestive process keeps up a continuous supply of formaldehyde vapor for the wound. The powder is made by drying 500 grammes of purified and dissolved gelatin in the vapor of twenty-five drops of formalin.

Foote has recently published a paper giving an account of forty-five cases of suppurative wounds in which he has used Schleich's formalin gelatin. He concludes that formalin has some antiseptic action, but not so great as to render a suppurating wound sterile. It seemed to control the infection for two days, and if the character

of the wound was such that this respite was enough to secure its closure, the result was perfect. If not, then whatever gain was made in the first two or three days was maintained, and the wound went on granulating from that point. This, however, is a distinct advance on the usual treatment. Another point in favor of the formalin gelatin is that it does away with the necessity of drainage. On the whole, Foote thinks the method marks a distinct advance in the treatment of suppuration, giving the most perfect results in those cases where the cellulitis is moderate and the pus abundant.

Alexander considers formaldehyde the "ideal germicide, deodorant, and antizymotic." He has used it in his practice for a year. He quotes De Buck and Vanderlinden as having used it successfully in one-half per cent. strength for washing hands and instruments, cleansing site of operation, and for rendering infected wounds, cavities, and sinuses antiseptic. Formalin does not spoil the edge of the knives, apparently not attacking metal at all. Dr. Alexander uses the pure forty per cent. formalin very successfully in chancroid and chancre, applying it locally, a single application being sufficient to cause the ulcer to heal rapidly. He found formalin solution a remedy for pruritus vulvæ when other drugs had failed. Four cases of diphtheria were treated with formalin and whiskey. The whiskey was given internally, and the atmosphere of the room impregnated with the vapor of formalin, direct application to the throat being also made with the formalin solution. He finds a spray of one-half per cent. valuable in hay fever, and a spray of one-per-cent. solution in whooping-cough. In ten cases of gonorrhœa he used a one-half-per-cent. solution, injected three times a day, with satisfactory results; he found the treatment free from the pain or irritation usually caused by the use of sublimate and other solutions.

Howland has treated six cases of gonorrhœa with formalin. In every case the gonococcus was found. He started with a five-per-cent. solution, but found this too strong. In the rest of the injections he used a one-half-per-cent. solution. For the first two or three days irrigations of one quart of hot formalin solution were given twice daily; afterwards once daily until the discharge ceased to contain the gonococci. No internal treatment was given except cathartic pills. All highly-seasoned food, alcohol, tea, and coffee were prohibited. The patients were advised to drink two to four quarts of pure water in the twenty-four hours. Dr. Howland noticed peculiar action of the irrigating fluid on the gonococci. They "shrivelled up" and lost their form.

De Smet claims good results from the use of formaldehyde in gonorrhœa in women. Sixty cases, some very obstinate, were cured. The vulva was washed with a 1:1000 solution, and the vagina douched through a speculum with a strong solution, varying from 2:1000 to 5:1000. If the uterine cavity and cervical canal were involved, some of the same solution was injected. When there is laceration of the cervix, tampons soaked in 1:1000 solution of formaldehyde are left for two or three hours in the vagina. When fungous endometritis is present the curette must be applied first. The applications give rise to no pain, and may be used daily, or every second day.

Lamarque had used formol in one-per-cent. solution for washing out the bladder and urethra, and in five-per-cent. solution for instillation. In acute gonorrhœa and in gonorrhœal cystitis he has not had encouraging results. In chronic gonorrhœa they have been better. He considers this treatment most successful in cases of tubercular cystitis. The only disadvantage is the pain caused by the drug, which, however, though intense, quickly ceases.

In ophthalmic practice formaldehyde has been used for some time. Valude, in May, 1893, made a communication on the subject to the Société Française d'Ophthalmologie.

Burnett has obtained excellent results in infecting ulcers of the cornea and in purulent conjunctivitis. Corneal ulcers may be touched with a solution of 1:200 or 1:500 every day. For general use as an antiseptic collyrium, a strength of 1:1000 or 1:2000 may be used, though the stronger of these sometimes causes a slight burning sensation.

Davidson finds one part of formalin in two thousand or three thousand of water the most serviceable strength of solution. When he tried it first in hypopyon ulcers, it was dropped into the affected eye three or four times daily, and it seemed of very little use, but on applying it freely every hour it acted very effectually. In abrasions of the cornea and in corneal ulcers, Dr. Davidson believes formalin will be of great value if applied freely and often.

Dr. Stephenson has found a solution of 1:2000 of service in muco-purulent and follicular inflammations of the conjunctiva when applied thrice a day to the everted lids. In trachoma it seems to have the power of reducing the amount of secretion.

Solis-Cohen has during the past year seen such good results in the treatment of tuberculosis of the larynx, alike in infiltrative, ulcerative, and vegetative cases, by means of formic aldehyde solutions, that he is tempted to believe that in this agent we have a

means of treatment superior to any other that he has ever used. He uses the commercial formalin, diluting it to the strength required, which ranges from one-half to four per cent. of formic aldehyde,—that is, from one to ten per cent. of the commercial formalin, which contains 0.40 per cent. of formaldehyde. Before making the applications the parts should be thoroughly cocainized, otherwise the application to the mucous membranes causes an intense burning, stinging, and even strangling sensation.

The mode of application is similar to that employed with lactic acid. The parts are thoroughly rubbed with the formaldehyde solution after previous cleansing and cocainization. Beginning with the weakest solution, the strength is increased up to ten per cent. of the commercial formalin, which corresponds to four per cent. of pure formaldehyde. This is the strongest solution he has found it necessary to employ.

Pottevin has tried formic aldehyde for ringworm. The hair having been cut short, and the scalp cleansed, a compress of cotton-wool soaked in a two-per-cent. solution of formic aldehyde was applied to the affected parts, or, better still, to the whole scalp. The whole was then covered with an india-rubber cap, or piece of oiled silk, and left on for twenty-four hours, when a fresh application was made.

The results were not encouraging, as in most cases the remedy did not effect a cure. However, according to an abstract in the Cincinnati *Lancet-Clinic* of November 7, 1896, forty cases of ringworm of the scalp, in hospital out-patients, were treated by formalin applications. The preparation used was formalin in full forty-per-cent. strength, which was vigorously rubbed in with a brush or mop for ten minutes, the hair having been shaved round the patches. The application was repeated every other day on four occasions, and then entirely discontinued. Of the forty cases, only five required repainting from non-eradication of the disease. Microscopical examination was always made before commencing treatment, and the presence of the tricophyton verified.—*Therapeutic Gazette.*

Reports of Society Meetings.

AMERICAN ACADEMY OF DENTAL SCIENCE.

The regular monthly meeting of the American Academy of Dental Science was held at Young's Hotel, Boston, January 6, at six o'clock P.M., President Andrews in the chair. The paper for the evening was read by Dr. J. L. Hildreth, of Cambridge, Mass. Subject: "To what Extent is Typhoid Fever Preventable?"

President Andrews.—Fellows of the Academy, it was my privilege last evening to attend the meeting of the New York Institute of Stomatology. Many of its members are also members of the Academy. Among them I met Drs. Benj. Lord, Geo. S. Allan, and E. A. Bogue, who wished me to remember them to the fellows of the Academy.

I have the honor to-night to present to the Academy Dr. John L. Hildreth, of Cambridge, who will read the paper for the evening.

(For Dr. Hildreth's paper, see page 373.)

DISCUSSION.

Dr. Smith.—Dr. Hildreth has very charmingly taken us from the mouth and the teeth to the intestinal tract. I would like to ask Dr. Hildreth if there is any good reason for a competent physician mistaking the diagnosis in typhoid fever? I know of a couple of cases where such a mistake was made. The patients were travelling abroad and were taken ill. They were supposed to have thoroughly competent physicians, and were treated some time before typhoid fever was ever mistrusted. It was not positively known until another physician was called and diagnosed the case as typhoid fever. From the facts which Dr. Hildreth has so ably put to us to-night we learn that typhoid fever is transmitted only through the excreta of patients who have that disease, and while he stated that the bacillus which produces typhoid fever bears a close resemblance to a harmless bacillus which is common in the intestinal tract, I believe he stated that it can be distinguished. Now, if that be true, why is it not possible, with proper care, to diagnose every case of typhoid fever as typhoid fever at once, without making an error which may lead to the loss of one or more lives? The doctor also

remarked, in speaking of that case, of the son of the milkman, along whose route the epidemic had prevailed, that it was somewhat of a question whether the young man had typhoid fever, but the suspicion was confirmed at the autopsy. Now, my point is, whether the presence of the disease could not have been detected before the young man's death?

Another question occurred to me during the course of his remarks, and that is, What becomes of the bacillus on the patient's return to health? We understand that after the bacillus has been introduced into the system, it finds a favorable habitation in the intestines, where it begins to produce its toxin; the system immediately rebels and sets about to manufacture an antitoxin,—in other words, there is a war going on between the system and its antitoxin and the bacillus and its toxin. I suppose that war goes on until the bacillus is entirely stamped out and expelled from the system.

Still another question I would like to ask, How many of us are using cooked milk? I drink a great deal of water, and I feel quite secure in that respect, because I use "Poland Spring" water; but as to milk, I use it on my oatmeal or cracked wheat in the morning, and now and then take a glass of milk at my meals, but as yet have paid no attention to its cooking or sterilization. Of course, I have been aware of its danger, but not so intensely aware as I am at this moment, and I would like to ask Dr. Hildreth and others if they use that precaution in their own households?

Dr. Hildreth.—The last question which the gentleman has asked is the easiest, so I shall answer that first by saying that I am one of those extravagant persons who have their own cows, so I do not have to give myself much concern about the milk that we use; but there have been times when I have not manufactured my own milk; and when such occasions arise, I sometimes have bought Pasteurized milk, and I have sometimes Pasteurized it myself, sometimes have it boiled, but never use it as we buy it from the dairy or grocery. The danger in some cases is very small and in other cases very large; we do not know where the danger lies, and I think there is some risk all the time. If you want to be on the safe side, the best way is to get into the habit of cooking your milk the same way as other articles of food. Sometimes, when a man is travelling, he will say to himself as he comes to one of those "ten minutes for refreshments" stations, "I will get off and get a glass of milk and a sandwich." Now, I would not drink a glass of milk in a railroad station for five dollars, and yet I am past the age at

which there is an ordinary likelihood of my contracting typhoid. When I am in the country I never care to drink a glass of milk unless I know about it. My attention was first strongly directed to this by a remark of Professor Sedgwick, who said that he could not be induced to drink a glass of milk away from home unless it was guaranteed by some physician, or he knew it had been properly sterilized. Pardon me if I say a word right here about cooked milk. It is not quite as digestible as the uncooked. Milk that is fresh, within a few hours after having been drawn, is very digestible; milk that has been pasteurized or boiled is not quite so digestible, and that is something which has to be borne in mind.

The other question which the gentleman asked, that of diagnosing typhoid fever, was something that I should like to have alluded to, if I had not feared that I should have wearied your patience; but with your permission I will now refer briefly to it.

The question of making an early diagnosis is one of those very interesting problems where all the information we can obtain is not always sufficient to enable us to make a decision at once. Our first knowledge of the case is that the patient has been suffering for five or six days from malaise, headache, diarrhœa, weariness, some little fever and restlessness at night, and these prodromata may continue for a period of fourteen days, and then generally comes a chill, and that is the time at which you generally date the beginning of the disease. Now, when the chill comes on, if it be a case of typhoid, you will find the temperature higher in the evening and a little lower in the morning in a perfectly regular way, and you will have a slight distention of the bowels, with frequent discharges which are yellow, like the dejections from infants. And yet, we may have all these symptoms, and not be able to say that it is a case of typhoid. In cases where there is such doubt, I have treated them just as though they were typhoid. I have observed all the precautions with regard to the destruction of the excreta, and have warned the families in such cases that great care should be taken to prevent the possibility of its spreading. Now, the question is, Why cannot the physician in the early part of this disease, during the first week, when the diarrhœa is pretty well pronounced, when it contains more of the bacilli than in the later stages,—why cannot he take the microscope and find out if the typhoid bacillus is there? If he found them he would say right off, You have got typhoid fever. Unfortunately, the making of the examinations of the stools, of the excreta, is somewhat difficult, and in hospitals, where they have the best facilities for that

kind of work, it is not often done; they prefer to keep the patient under proper care and wait a few days for developments. Now, when the fever gets on to about the eighth day, you usually get rose-spots upon the abdomen; then you may be secure in your diagnosis. But suppose you have a case where the rose-spots do not appear? Then you think of acute tuberculosis, galloping consumption. You very often have a cough in typhoid fever, and this, with the fever and emaciated appearance of the patient, might lead you to think, This may be a case of acute tuberculosis.

With reference to the Somerville case, I did not intend to say that the physician in charge had any doubt as to its being typhoid; it was the patient's father, who insisted that his son did not have typhoid, but an autopsy was held which proved the physician was right.

An important discovery in regard to the serum of the blood of typhoid patients has been made by Widall, which now aids us wonderfully in diagnosing the disease. If you take a patient who has the disease sufficiently pronounced, so that his system begins to manufacture an antitoxin, to oppose the toxins of the typhoid bacillus, and prick his ear and get a few drops of blood (Widall, in his first experiments, drew thirty or forty drops), and put it under a little glass and allow it to stand a while, it will separate into the serum and the clot; then take some of this serum and introduce into it a pure culture of typhoid bacilli, which I have told you were moving actively in all directions. If you observe this culture under a glass of the twelfth immersion, when this serum comes into contact with the bacilli they at once show that they have met with something they do not like. In three or four minutes they all huddle together as if they were trying to get away from something, and in ten or fifteen minutes they all remain perfectly still, as if they were overcome. The effect of this experiment is to show us that the serum that we took from the ear of the patient who was supposed to have typhoid was really manufacturing antitoxin, and that the patient who was supposed to have typhoid did really have typhoid. I have applied this test to almost every case that I have had at the hospital this fall, and with the best of success. The question comes, How early can we use this test, how soon does the antitoxin of the system become powerful enough to effect the bacilli of a culture? I think there is a doctor in one of the New York hospitals who claims that this effect can be obtained as early as the fourth day. You see this test may be very valuable when there is a patient in the ward about

which there is a doubt. He has advanced, say, to the eighth day, and he has not had any rose-spots, and you are in doubt whether he is developing miliary tuberculosis, typhoid, or some similar disease. You draw a few drops of his blood, allow the serum to separate from the clot, and put the serum into a pure culture of the typhoid bacilli, and the very active germs, which are roaming in all directions, in the course of five or eight minutes are all moving together, and a few minutes afterwards there is not a sign of life in the whole of them. Now, how much this test will be perfected and to our knowledge of how best to oppose the toxin made by this bacillus it is difficult to predict. As I have stated before, we are not altogether hopeful of evolving a system of serum therapy which may effect the typhoid bacillus in a manner similar to that in which antitoxin acts on the diphtheritic bacillus. The effect of the serum of the typhoid fever patient upon the bacillus in its pure culture shows that if we could artificially produce this antitoxin we would be in as favorable a position with regard to the treatment of typhoid as we are now in the treatment of diphtheria.

Dr. Brackett.—I wish to express my admiration for that to which we have listened this evening. I have been glad to note the practicality of all that has been put before us, and happily surprised that the speaker should tell us that immunity from the risk of taking disease from milk is so readily provided. I had supposed that brief boiling was not sufficient to guarantee destruction of typhoid fever germs. The matter of conveying disease through milk was brought to my attention several years ago by a lady who had a young son a student in an English school, and she said it was the custom of that school to boil the milk before using. In our household we have long practised scalding all the milk, and for us it is made more palatable by the process. Our water-supply is rain-water, carefully gathered and stored, and we do not drink much of that without cooking.

I would like to ask whether it is supposed that in contaminated streams or water-supplies, with the water at ordinary temperatures at any season of the year, there goes on proliferation of typhoid germs, and what is known concerning their reproduction outside of the human body.

Dr. Hildreth.—It is not altogether clear to biologists whether they do propagate in large quantities or not. How and where they propagate outside of the body has never been discovered. You can grow them in some media, but on account of the great activity of the germ no one has ever seen the process of reproduction, or knows how or when it takes place.

Dr. Briggs.—I would like to ask one question in regard to the original contamination of the milk-supply,—whether Dr. Hildreth thinks it is due to the cow drinking contaminated water, or to the handling of cows' udders by men who have not taken care of their hands, or possibly to the water which may have been added to the milk, or to the water which may have been used in rinsing out the cans?

Dr. Hildreth.—The majority of cases are undoubtedly due to the hands of men who do the milking or who handle the milk. It is possible for a cow to transmit it simply from drinking contaminated water. The number of cases would probably be small that could be traced to the rinsing out of the cans or the addition of water to the milk.

Dr. Briggs.—Then, in other words, if the hands of the men who work about the farm, and who handle the milk, are clean, and there is no water added, you would expect no danger from that milk?

Dr. Hildreth.—Not from typhoid.

Dr. Williams.—I would like to ask Dr. Hildreth if observations or investigations have been made the results of which would lead one who has had typhoid fever to hope that he has become immune from typhoid hereafter?

Dr. Hildreth.—The fact that typhoid fever is so rare the second time shows that a person who has recovered from an attack of it may expect a reasonable degree of immunity. In that respect it is different from diphtheria. A person may recover from diphtheria and the immunity not remain more than two or three months, and in most cases it does not remain longer than a year or two. This has been proved by the examination of the serum of patients who have recovered from diphtheria; it has been observed that the antitoxin of the system disappears after a little while, and the patient is again susceptible to the disease. The immunity is much greater in typhoid, but unfortunately is not complete. I have known of a case where a patient succumbed to the third attack of typhoid fever.

Dr. Clapp.—I would like to ask Dr. Hildreth if the Pasteur filter or the Boston filter excludes the bacilli of typhoid? I have a personal interest in asking this question. For the last six years I have used in my family water of the Boston supply, but it has all been filtered through a Pasteur filter or a Boston filter, and I have used the latter for a large portion of the time. It is attached to the pressure and connected with a glass globe that holds about two gallons. It is arranged automatically, so that when a certain

amount of water enters the globe the supply is cut off. Now, we sometimes use that globe for perhaps three months without cleaning it out, and at the end of that time there is not enough sediment in the globe to soil a white handkerchief if used to wipe it out.

The reason that I have used water in this way in preference to the celebrated springs of Boston and vicinity is that to my mind I am surer of obtaining pure water, and I can tell you a little story which I think you will agree fully justifies my belief. A gentleman that I know was very much enamoured of a certain well-known spring water; no other water would do, and he used so much of it that he had it come by the barrel, and after using a portion of one of the barrels he thought he noticed something wrong about it, and an investigation showed a mouse in the barrel. A mouse will not go through my filter.

Dr. Hildreth.—With reference to the Boston filter, I cannot speak very certainly. It seems to me that it should be a good filter. The other day my attention was called to it, and this same question was asked me, and, while I have never used one, I have examined it carefully; had the cover taken off and looked all through it, and it seems to me it should be a good filter, and that the water that passed through it should be sterile.

With reference to the Pasteur filter, when they were first introduced, scientific men were very much interested to see if the water, after passing through it, was really sterile water. Many experiments were made abroad, and at the Institute of Technology, with their large and completely equipped laboratories, they made a series of investigations and found that the number of bacteria in the filtered water was very small; the most they found in any of those experiments was two-tenths of one per cent., which is practically pure water. I have used one of the Pasteur filters for some time in my house. The president of the State Board of Health, Dr. Wolcott, has given his attention very largely to this matter of pure drinking water, and he is a better authority on the subject than any one that I know, and it is reported that he says he would be perfectly willing to drink the water of Chicago, which Professor Sedgwick had examined and found to contain several different kinds of dangerous germs, if it only went through a Pasteur filter. I think a Pasteur filter is absolutely germ-proof.

Dr. Barker.—Speculation is sometimes interesting if it is not profitable. We have heard several things this evening which might make good subjects for speculation, and one of them is, Where is the native heath of this species of life which we have heard

so much about? We know that the home of the elephant is in Asia, the home of the lion in Africa, of the kangaroo in Australia, etc., but where is the home of the typhoid bacillus? Where do they come from? How do they get into the water or the milk which we drink? Do they grow there spontaneously? Scientists tell us that such a thing is not possible. The same power that made a bacillus made a banyan; the same power that made a micrococcus made the moon. You know it is said that "great fleas have little fleas upon their backs to bite 'em, and these again have lesser ones, and so on, *ad infinitum*." We must get water into the system and we must take food. The doctor has told us that if we wished to be sure of escaping germs we must not drink milk or surface water unless it has been boiled. Now, it is impossible for most places to get water from subterranean sources by vast systems of wells, driven so far below the earth's surface as to be below contamination. That is one thing that I think our municipalities and boards of health are remiss in, not directing attention to the advantages of subterranean sources of water. How manifestly impossible it is to get pure water from the vast water-sheds that feed our water-supplies! We find that cattle, horses, and sheep graze and live upon the hill-sides, and when there comes a rain everything on these hill-sides is washed into the rivers and brooks which so many people are obliged to use for drinking water. It is a comfort to know that if we are obliged to drink surface water that we may escape danger by boiling the water, but above all and beyond all, and it is a point I think is too often lost sight of, we should aim to keep ourselves in such a condition of health that these germs will have no effect on us. It seems to be conceded that the man who is a vital man, who is brim-full of light and health, enjoys immunity from their attacks. That is one way, and that, in my opinion, is the better way for us to combat them. Lice, as we know, attack weak, puny plants, they attack animals that are weak and sick. The parasites may be there at all times, but they do not attack the plants or animals successfully until the vitality is low. Wherever you find animal life you will find it has its parasites, and the most successful way to combat them is, if possible, to get within so much life, so much vigor, that they will be unable to get a foothold.

In my own household I do not feel it necessary to use the precautions which the doctor mentions, as my water-supply comes from a point sixty-nine feet below the surface and through thirty-five feet of dense hard pan, amounting almost to slate. With re-

gard to the milk-supply, like our friend, I keep a cow in my stable, and I try to keep her clean enough so that she might be brought into the sitting-room if it were ever necessary.

Dr. G. T. Baker.—If I understood Dr. Hildreth, he stated that after forty years of age a man was practically immune from attacks of typhoid fever; how is it with extreme youth, or babies, especially those that are bottle-fed altogether?

Dr. Hildreth.—It is not known exactly at what age they become susceptible to the disease, but I think it is very probable that even very young babies, say two or three months old, are sometimes attacked by it. The cases are not very common until about five years old,—that is to say, the hospital records do not show anything much under that age, but I sometimes think that many cases are attended at home and may not be known as typhoid. I saw a case this summer of a child not more than six months old who had been sick with a disease which ran a course much the same as typhoid. The cases are comparatively rare under four and after forty, although I have known of a case of a man dying at sixty-five, and the autopsy showed the cause to have been typhoid fever. The most susceptible age is from twelve to twenty-five.

Dr. Briggs.—If the danger to milk is from handling, why is not there the same danger in handling of waters, as in bottling or barrelling? why is not there just as much danger of it by a man suffering from walking typhoid?

Dr. Wilson.—I would make a motion that a vote of thanks be extended to Dr. Hildreth for the very interesting and instructive talk he has given us this evening.

Unanimous vote.

William H. Potter, D.M.D.,
Editor American Academy Dental Science.

THE NEW YORK INSTITUTE OF STOMATOLOGY.

A regular meeting of the Institute was held Tuesday evening, March 2, 1897, at the residence of Dr. J. Morgan Howe, No. 58 West Forty-seventh Street, the President, Dr. Geo. S. Allan, in the chair.

The minutes of the previous meeting were read and approved.

COMMUNICATIONS ON THEORY AND PRACTICE.

Dr. James G. Palmer read an article on "Defective Articulation," etc., by Dr. J. G. Brigiotti, of the École Odontotechnique, of Paris.

(For Dr. Brigiotti's paper, see page 439.)

Dr. S. E. Davenport.—Dr. Brigiotti, it seems to me, should be commended for his very successful use of photography in illustration of the points of his paper.

I have many times thought how much better the changes which are brought about by prosthetic appliances could be shown if we had, as the patent medicine men are always careful to have, the pictures of the patient "before and after." If we had a particle of doubt regarding the advisability of Dr. Brigiotti following the plan which he has so concisely explained, the doubt would be dispelled by one glance at these excellent photographs, for there is noticeable a very marked and advantageous change in the appearance of the patient's features.

Dr. Benjamin Lord.—There seems to be a great deal of interest in the report just presented, the casts and photographs in illustration being of special value, and we can but feel greatly indebted to the friend who has thus contributed to our edification this evening. Accordingly, I move a most hearty vote of thanks to Dr. Brigiotti for his trouble and interest in our behalf.

The motion was carried.

Dr. F. Milton Smith.—About a year ago Dr. Kirk read a paper before the First District Dental Society on "Infantile Scorbutus." My attention was especially attracted to it at the time, as I had never seen a case in practice. Before two months had passed a lady patient came to me to ask if I could give her any light in regard to her baby's teeth and gums. The child had the two central incisors, and the gum was so much inflammed as to almost cover them, and was very black in color. The baby was thirteen months old. I found upon questioning the mother that the child had every symptom of infantile scorbutus. She had been able to walk, but had lost the use of her limbs. The physicians had treated the child for rheumatism, and one of them suggested that the child had dental paralysis and several other things. I suggested that the child be fed upon beef-juice and bread, also bread and milk and orange-juice. In the course of three weeks, upon this change of diet (the child having had almost exclusively malted milk from its birth), the little one was almost well again. That was about ten months ago.

About six weeks since a gentleman came to my office and told

me about the condition his child had been in during the summer. She had been very much run down, and seemed to become pale without any apparent loss of appetite, her digestion was good, and yet the little one seemed to fade away. The child had only the two central incisors at that time, although it was about thirteen months old. It had the same condition of the gums as the other case. I asked if the child walked, and he said yes, but it had lost the use of its limbs, and seemed to suffer much pain when it was touched. He said the physician suspected that there was some trouble with the food, and so changed it, and the child began to improve immediately. Its food had been Carnrick's food almost exclusively from birth to the best of my recollection. The physician did not diagnose the case as infantile scorbutus, but I think there is no question about it. He ordered a change of food, and gave the child beef-tea, cream, cod-liver oil, etc., and it seemed to improve at once. Physicians seem to overlook the cases very often for some reason or other. I believe, up to about a year ago, there were only about forty cases reported by physicians in this country.

Dr. C. B. Parker.—Dr. Smith has repeated an experience I had in my own family only about a year ago. My physician wished to bring my child over here to a specialist, and I told him I thought if the food of the child were changed and it had some fruit that the conditions would be changed. The little one lost the use of her limbs for about a month; at the end of the month she was so she could be up on her feet again, but she did not walk for about three months. She was brought up on malted milk.

Dr. Brockway then read a paper by Dr. Louis Jack, of Philadelphia, entitled "Treatment of Devitalized Teeth."

(For Dr. Jack's paper, see page 370.)

The President.—It is well for us to have so complete a statement from so distinguished an operator as Dr. Jack as to his method of treating root-canals in all their various stages. I hope there will be a free and full discussion of the paper which is now before you.

DISCUSSION.

Dr. J. Morgan Howe.—I am interested in Dr. Jack's use of aristol. I would like to ask if there is any one present who uses it?

Dr. Babcock.—I have used aristol in root-canals a little over two years, in combination with oil of cinnamon or oil of gaultheria and carbolic acid, and have had great success with it. I always try to get direct access to the cavity, believing in thorough mechanical cleansing first, then following with antiseptics. About four years

ago a gentleman came to me complaining of the right upper first bicuspid, which had been treated and dressed for several months. I felt that unless there was some abnormality in that root there appeared to be no reason for the continuation of the trouble. I found there had been an opening made only large enough to admit a broach, so I opened the tooth thoroughly and found that there were two canals, as usual. One was most beautifully filled; the other had putrescent contents, and I did not wonder the trouble was going on. I merely mention this believing thorough access should always be had for mechanical cleansing, even though the tooth may apparently be weakened thereby. A tooth that behaves itself, even though more than half composed of filling, is far preferable to one that is always giving trouble, even though it be nearly sound.

Dr. Brockway.—I quite agree with Dr. Babcock as to the importance of mechanically cleansing a root, and I am glad Dr. Jack has put so much stress upon the importance of access to root-canals as the first step. The matter of treating pulpless teeth used to be a great bugbear, but with our present knowledge on the subject, I take these cases with very little apprehension. In fact, my assistant rather amused me, not long since, by wishing that some more "nerve cases" would come in. A few years ago to express such a wish would have seemed to be inviting trouble. In the treatment of roots with putrescent pulps my great reliance for the past three or four years has been on Dr. Schrier's preparation of kalium natrium. I know, however, that many are not using it as I am. I have found it extremely useful, shortening and simplifying the operation very much. By its use, with thorough attention to mechanical cleansing of the canals, I have escaped almost all untoward subsequent symptoms, such as we used to dread, and frequently had occur. As to filling root-canals where the root is a simple one and accessible, like a cuspid, incisor, or the palatal root of an upper molar, I do not know of any better method than that practised by Dr. Richmond for a number of years, and that is, filling the root with a peg of wood whittled out to fit it and dipped in the root-preparation, which I think Dr. Lord brought to our notice some years ago. I do not know that I have ever had trouble from a root filled in that manner, and I have filled hundreds of them. Within the past year I have used, instead of that preparation, the article introduced by Dr. White, of Silver City, N. M., called balsamo del deserto. It is a wax-like product of some insect, I fancy. It is antiseptic, insoluble, remains soft, and seems to me to be admirably

adapted for the purpose of completely sealing the apical foramen of a root, and the entrance to the tubuli in the dentine.

Dr. Babcock.—I would like to say a word in regard to the use of aristol and the essential oils. This combination has such a tendency to discolor that if used in the front of the mouth it would not do to fill the root too full. I use a gutta-percha cone, forcing it up after saturating the canal with the fluid, and then use oxychloride of zinc over that. I found if I filled the entire root with the gutta-percha, it would be apt to discolor the tooth.

The President.—Aristol and oil of gaultheria I have used, as mentioned by Dr. Jack, for several years, with a great deal of satisfaction. I would like to call attention to the use Dr. Jack makes of permanganate of potasssium for putrescent canals. I know of no more effective method of destroying germs when a tooth of that description is opened and a piece of bibulous paper used to absorb the liquid contents of the pulp-chamber than to place a crystal of permanganate of potassium at the entrance to the canal, and allow it to remain there for ten or fifteen minutes, the tooth then being syringed out with tepid water, and closed in such a way as not to force anything through the apical foramen. It is almost impossible for a root treated in that manner to retain germs of any character that will do harm. I heard of this through Dr. Jack, and my first question, when he told me of it, was about the discoloration. He replied, as I have since found in practice to be true, that the danger was very slight, especially if a little oxalic acid is used. Although I have used this method repeatedly in the last year, I have yet to see a case where the discoloration amounted to anything. The beneficial results have been most marked and satisfactory.

Dr. Gage.—May I ask Dr. Allan what he does with roots where there seem to be no contents,—where they seem to be perfectly sweet, and there is no odor whatever? Does he fill those immediately?

The President.—The mere fact that there is no odor does not indicate definitely that there are no pus-germs, or germs that will induce inflammation, and while the treatment indicated may not be so positive and decisive as in cases where there is an offensive odor, it must be applied with the utmost care. In those cases I use aristol and oil of gaultheria. I have also used two and one-half to five-per-cent. formalin solution.

Dr. Davenport.—In my opinion, Dr. Jack should be thanked, not only for his very complete description of most excellent methods of treatment, but for his thorough honesty,—although that we

would naturally expect from him. Many of us have been so accustomed to the descriptions of essayists, where everything is claimed, even the perfect mechanical cleansing of the buccal roots of upper molars and the anterior roots of lower molars, that I am sure we all notice Dr. Jack's confession and are refreshed thereby.

The President.—One more point I would mention. The use of germicides in the future will be largely determined by one fact,—whether they are organic or inorganic in their origin. I do not believe there is any organic germicide, other things being equal, that is as reliable as an inorganic one. Oil of gaultheria, or oil of cinnamon, on a pallet of cotton left in a cavity is sure, sooner or later, to become food for germs, if there are germs there. It is a wise thing, therefore, where one has a choice, to choose the inorganic germicide rather than the organic.

Dr. Geo. A. Maxfield.—This subject is a very broad one. I have just closed the third lecture on this subject at the dental school to-day, and have hardly covered the ground. Dr. Jack divides the subject into three heads, but we all know that these heads can be subdivided almost innumerably. I can heartily commend almost everything in Dr. Jack's paper, yet I do not use aristol. I have tried at various times the different methods advised for the treatment of pulpless teeth, but fail to find a better method than the one I have used for the past ten years. I seldom place the dam on a tooth either where I want to open into the pulp-chamber or treat a pulpless tooth. To me it is in the way. My first precaution is to get the mouth into an antiseptic condition, and that I do by using a strong solution of hydronaphthol as a mouth-wash; then I see that the cavity is mechanically cleansed. In opening the pulp-chamber I cover the parts and have my drill covered with a saturated solution of iodoform in eucalyptol. I use iodoform a great deal in treating pulpless teeth, and I have yet to learn of any remedy that will do what iodoform does. We need something besides a germicide and an antiseptic. We must destroy the germs of course, but we must also destroy the infection,—the ptomaines,—and nothing will do this, in my opinion, like iodoform. In regard to making the opening through the gums, Dr. Jack uses what to me seems an exaggerated term. I never hear this word, alveolotomy, but what immediately the word ovariotomy flashes through my mind, and with it the comparison of the two operations. The attempt to magnify the simple operation of piercing the alveolus by calling it alveolotomy is hardly warranted. One point I particularly emphasized in my lecture to-day was that great care must

be exercised in making the opening through the alveolus to reach the end of the root of the second inferior bicuspids. Often the roots of these teeth are very long, and there is danger of penetrating the mental foramen. A case of this kind came under my observation a few years ago, in which paralysis of the lip and chin resulted, lasting several weeks. I use the peroxide of hydrogen more as a mechanical cleanser than as an antiseptic. In its effervescence, it throws out the *débris* from the canals. I use Dr. Callahan's method, the acid treatment for opening the canals. Since adopting this method I have many times been surprised, when treating the superior molars, to find four canals. After opening into the canals I prefer to use the chemically pure hydrochloric acid, full strength, instead of sulphuric acid, and use chlorinated soda to neutralize the acid. In pericemental inflammation I have used for several months, with excellent results, the cataphoric application of the compound tincture of iodine. To illustrate this: A young man while attending Harvard College had one of the lower molars treated and filled, but the filling had to be removed the next day. Three attempts were subsequently made to fill this tooth without success. When he came to me a few weeks ago, the cavity and canals had remained open for over two years. After thoroughly washing out the canals I placed a dressing of a five-per-cent. solution of formalin in the canals and sealed the cavity with gutta-percha, giving instructions to return if any trouble occurred. In the afternoon he returned and said he would be forced to have the filling removed as the tooth was beginning to trouble him. I gave a cataphoric application of the tincture of iodine for ten minutes, and there has been no trouble with this tooth since.

Dr. Evans.—Dr. Maxfield has made a statement that involves a scientific question. He said iodoform destroys the ptomaines and aristol will not. I would like to ask for his reasons for the statement. The teeth in which we want to destroy ptomaines are those in which we find a putrescent pulp or a septic condition present. In such cases we want an agent that will do more than destroy the ptomaines. We want one that additionally will exert a chemical action on sulphuretted hydrogen and other gases present and aid in eleminating them. By other gases present, I mean those ethereal gases, stinking gases, described by Vaughan and other writers who have made a study of putrefaction.

Dr. Maxfield.—I am not a scientific chemist or bacteriologist to go into that. I watch and study everything that I can find in regard to the subject, and I have yet to learn of prominent experi-

menters who make the statement that aristol will destroy the ptomaines. It may have been made, but I have not seen it.

The President.—What foundation has Dr. Maxfield for his statement that iodoform does destroy the ptomaines? Why is destroying the ptomaines of more importance than destroying the germs?

Dr. Maxfield.—Those who are acquainted with the history of iodoform will remember that this fact was very strongly brought out when it was shown that the bacteria were able to live in the iodoform powder; the surgeons began to wonder why they had such wonderful success with iodoform, and many theories were advanced. Finally, while every one admitted that it would not destroy bacteria, they found by inserting iodoform into the wound and then inserting bacteria, no evil results followed. By inserting the bacteria first and then the iodoform, they had bad results; then they isolated the ptomaines from the bacteria, and by introducing the ptomaines and then the iodoform there were no evil results. As it was impossible to isolate the bacteria from the ptomaines, they could not prove that it had no effect on the bacteria, if there were no ptomaines.

Dr. Evans.—That does not answer the question. I asked why iodoform destroys the ptomaines and aristol does not. That is the point I desire to be informed upon. It is an important one to us as dentists to know whether we should use aristol, a compound of thymol and iodine, which has an agreeable odor, or use iodoform, the odor of which patients can detect the moment they enter the front door. I cannot tolerate disagreeable odors of drugs in my office. I use a saturated solution of aristol with the essential oils. If I gave my record to this society for the last five years with the use of aristol it would scarcely be believed. The benefit we get from the use of either of these substances, as I understand it, is that the free iodine is eliminated. In the most grave operations in the Post-Graduate Medical School they use aristol in place of iodoform. With aristol we get all the effects derived from such a substance as iodoform, and there is not the disagreeable odor.

Dr. Gage.—May I ask Dr. Maxfield whether he has ever had a tooth discolor yellow from the use of iodoform?

Dr. Maxfield.—Never.

Dr. Gage.—I can show one. The only thing that has been in that tooth is iodoform and eucalyptus. There is a yellow color, and I would like to get it out.

Dr. Smith.—I gather from Dr. Jack's paper that it is the exception rather than the rule for him to fill roots of teeth without con-

tinued treatment. I would like to ask whether that is the accepted method with the gentlemen here present. I confess it is not mine. It is the exception rather than the rule for me to treat repeatedly, sitting after sitting.

Dr. Babcock.—That thought occurred to me when Dr. Brockway was reading the article. When I first began to practise I did treat teeth time and time again. I afterwards lessened the number of treatments, and now my custom is at the first visit to use hydrogen dioxide to cleanse the canal, then drying as thoroughly as possible, using strong alcohol to evaporate any moisture present, and sealing the cavity after introducing the preparations I spoke of. At the next visit I almost invariably fill the tooth permanently, and have no more trouble than by treating for six months.

Dr. J. Morgan Howe then read a paper entitled, "Some Points in the Antiseptic Treatment of Root-Canals."

(For Dr. Howe's paper, see page 364.)

DISCUSSION.

The President.—Dr. Howe's paper is now before the Institute for discussion. Does the chair understand Dr. Howe that he would state it as a fact that there is no albumen present?

Dr. Howe.—I suppose it to be a fact, as I have stated, and I have tried to coagulate putrid matter, but have not succeeded in doing so. I will not say that it cannot be coagulated, but I have not succeeded in doing so.

Dr. Littig.—Dr. Howe does not believe that there is any albumen in there, as such?

Dr. Howe.—No; the albumen has been disorganized; it ceases to be albumen, because it has been disintegrated, or split up.

Dr. Maxfield.—With the nitrate of silver, what effect is obtained? Is it coagulation or is it something else?

Dr. Howe.—I am not prepared to say. I have not tried it on putrescent matter.

Dr. Maxfield.—I would like to thank the Executive Committee for presenting two such valuable papers, and I feel that I have been most fortunate to have had the privilege of hearing them. I am very much interested in the application of nitrate of silver in the treatment of pulpless teeth, and I would like to ask Dr. Howe if he can give us anything more than he gave in the paper. Is there any evil results to the pericemental tissue from the transfusion of the nitrate of silver through the root of the tooth?

Dr. Howe.—I know practically nothing about silver nitrate in

the roots of teeth. My favorable opinion of it is based upon what I know of its action in uniting with organic matter elsewhere. The demonstration that Dr. Bethel made of the possibility of forcing the salt into root-canals in such a way as to completely fill them, as those specimens showed that were sent here for exhibition, seemed to me to suggest an entirely new way of filling canals. I have no doubt that the tissues beyond the apex of the root will be perfectly safe when the proper amount of galvanic current for use in such cases has been determined. I should suppose the best results would follow, when a certain amount of organic matter remained in the canal treated with silver nitrate, for it is not the filling of the canal with the salt that is to be desired, but with the compound it forms with organic matter. And I should suppose that periapical tissues would be most likely to be injured, when the root-canal had been previously cleansed.

Dr. Littig.—Would not the precipitation of the nitrate of silver take place in contact with albumen, if it passed out into normal tissue and so render it comparatively harmless?

Dr. Howe.—I should not call it precipitation. Silver nitrate is a caustic and is entirely capable of destroying tissue as such. It would as quickly convert the living as dead tissue into a new compound, and it might be possible to do harm with it. We must determine the amount of galvanic current proper to use for the purpose, I think, before we can be sure that we may not do harm, but the practical results obtained by those who have used it are of far greater value than any opinions formed without practice of the method.

Dr. Babcock.—The presence of any organic substance in aqueous solutions of nitrate of silver will generally precipitate the silver almost instantly, consequently, the nitrate of silver being carried into a tooth in the form of an aqueous solution would be precipitated, and there would be none to go through the foramen.

Dr. McNaughton.—Dr. Bethel said he could not force it through, no matter how long he tried.

Dr. Babcock.—Since he forced it into the tubuli, there is no reason to suppose that it could not be forced through the foramen.

Dr. Maxfield.—In regard to the use of chloride of zinc, some may remember the controversy between Drs. Harlan and Kirk. I had a little experience at that time, which Dr. Kirk used to prove his ground. Having some correspondence with him, and being interested in the controversy, I wrote to him that I had two cases that proved his theory. He answered at once, requesting me to give him the details, and my description appeared in the *Dental Cosmos*

under "Hints and Queries." In those two cases of lower molars, I had placed the dam on, and removed the pulp with cocaine. To coagulate the stump end of the pulp, which is necessary in those cases, I had used the chloride of zinc. This set up a severe inflammation in the pericementum, which took considerable time to allay. There was normal albumen and there must have been coagulation in the canal, yet it did not prevent the chloride of zinc from penetrating through to the pericemental tissue.

Dr. Brockway.—If any gentleman has ever undertaken to fill root-canals with the oxychloride of zinc, he probably has had some little experience with the effect of chloride of zinc when forced through the foramen. I remember I had two or three such cases, and the recollection of them is not very pleasant. Since then I have not used it for that purpose. This, of course, was many years ago.

Adjourned.

S. E. Davenport, D.D.S., M.D.S.,
Editor The New York Institute of Stomatology.

Editorial.

AMERICAN DENTAL ASSOCIATION AND REORGANIZATION.

Before another issue of this journal reaches our readers the annual conventions will have assembled at Old Point Comfort, Va., and the very important work delegated to each to perform will have been, in part, accomplished.

For many reasons this annual gathering of the several organizations will be the most important held for many years, as questions affecting vitally the interests of the dental profession will be presented, and their final adjudication will require the combined thought of many minds to effect an amicable solution.

The American and Southern Dental Associations meet with the intention of grappling with a problem which must be settled now, as it will be an unwise proceeding to continue it, and be a disturbing element in national society work if left for a future period to disentangle its many complications.

The concentration and subdivision of national work, which of necessity means vital changes in present methods, cannot be ac

complished without sacrifices of the attachments of many years, and a relegation of older systems to past history. The union of the American with the Southern, which has occupied much thought for many years, is but a part of the work. This at first was the central idea, but from this has developed more enlarged views which have, in degree, submerged the original question, and forced the more important one to the surface, What shall be the character of the organization or organizations to take the place of the old?

The subject has the past year been very fully discussed in the various societies throughout the country, and the delegates from all sections should by this time be fully cognizant of all the difficulties as well as of the various proposed methods of affecting reorganization that will meet all demands.

The general trend of thought seems to be towards the formation of an entirely new central body, at least new as to name if not new as to systems of work. The condition of the present organized efforts, while suitable for developing the profession, have not been found to meet the requirements of the advanced thought and practice of the present, and will most assuredly fail to satisfy the needs of the future.

The main question of a union of effort is not, from present indications, one that will meet with extended opposition. That it will occasion some friction is to be expected, but the sentiment has been continuously growing that the time has arrived when this must be accomplished, and it is the duty of all to sacrifice sentiment and long attachments to professional needs.

It is presumed that this will be the least difficulty to be overcome at Old Point Comfort. The widely diverse opinions as to methods of reorganization will doubtless be found more difficult of settlement.

The adoption of a constitution and rules for the government of any new organization is one of the most troublesome that all bodies have to meet, and it is to be hoped that the committee having this in charge will present a form of rules so clearly stated that they will avoid the necessity for long, tedious, and often times irrelevant debates.

The method usually adopted is to base an organization on the plans of similar bodies in the past, both in medicine and dentistry, with no attempt to engraft ideas more in consonance with the advanced thought of the present time and better adapted to the requirements of a more active future.

Without any desire to radically change old systems, the writer

feels that to simply change names and not methods would be no gain, but rather an almost irreparable loss, as, in all probability, the opportunity for decided advance will not again occur in a generation. It, therefore, seems to him that the subject should be met not in a narrow spirit, but with an earnest desire to make the principal and governing organization worthy to represent the dental profession of America.

The suggestions that arise in the mind of the writer may not meet this demand, but, in his judgment, should form the bases of all future dental organizations. The subordinate societies may, perhaps, be arranged more effectually on present methods, but whatever may be adopted in regard to these the objective aim should be of an educational character. This is only partially accomplished by the very loose methods prevailing. These are, first, papers and, second, discussions. Very little attempt is made to regulate these, and the result is an immense amount of verbiage with a small quantity of solid pabulum. This could all readily be changed by more positive systems, requiring original work on the part of the members and limiting discussions to the subject-matter of the treatise presented. The local organizations should be strictly educational, and to attain this something more than we have at present should be adopted.

State Associations are assuming more and more legislative functions and have practically ceased to be scientific bodies. It is not possible, apparently, to change this, for their character is predetermined by the increasing tendency to law-making and law-enforcement, the end of which cannot now be foreseen. These bodies, therefore, may be left for time and circumstances to modify and perhaps destroy, for they are an anomaly in scientific thought as at present arranged.

The true scientific organizations may, therefore, be classed with the local, district, and national bodies. From the lowest to the highest there should be intimate and graded scientific relations.

To meet this demand there should be an entire change in the plans of representation. The local bodies being the source of power, the greatest care should be made to have these self-training, and as all persons require force of some kind to compel labor, this must be found either in the natural incentive to original work or in the rules governing the association. This applies with equal power to the district societies. In simple terms, the members should be trained here to exact methods, and, whether it be the simple or complex, they should be forced to give to it their undivided interest, for one

clearly expressed idea, with an original flavor, is worth whole reams of platitudinous expressions. Such training is not an impossibility.

This foundation simplifies the formation of the national body. To this organization delegates should be sent, not as now, indiscriminately, but upon a basis of original work. The individual member of the local or district association who has exhibited a capacity for original work through essays presented, should be delegated to the parent body, and that for a period long enough to make him thoroughly conversant with the work. Delegates should be selected also for varying periods, so that the central body should never be left without an active working contingent. The present "permanent membership" should be quietly permitted to sink into oblivion, and in its place might be adopted an honorary, permanent membership, given only to those who have spent a good portion of their lives in original labor and have thereby added to a knowledge not possible of attainment by the majority. The number in this class would be small, but it would be an honor to those attaining it, and a prize worth the seeking. The membership of this national body, composed as it should be of the best scientific elements, would give a character to the organization similar to that possessed by leading associations now working in European countries. It would do more than this, for it would raise the standard of the dental profession to a degree that would command the respect of all cultivated persons.

The profession of dentistry to-day cannot afford to lean on the past. It must move forward or retrograde. It is, therefore, our highest duty now to let the "dead past bury its dead," and seek broader methods, that the present advanced professional education may have a field for fuller development. At no period in dentistry the world over has there been a more promising outlook. Hosts of young men are being sent out from the dental colleges trained as never before. They are, as a rule, truly professional men, and, in the near future, this should have a pronounced influence upon the intelligence of the period. It will, therefore, be a positive error if plans fail to be devised to place this growing intelligence where it will do the most effectual work.

In reorganizing, let it not be on antiquated constitutions, but aim to have these so framed that they will draw the educated, but at present isolated, elements and ingather them to the fold, and thereby strengthen the dental profession from the lowest to the highest organization. Thus arranged, the work would be worthy the ambition of any individual. Are these ideas Utopian?

THE AMERICAN MEDICAL ASSOCIATION.

The recent very successful meeting of this Association in Philadelphia, in point of numbers and enthusiasm, has demonstrated very conclusively that the professional spirit in that body has not been lessened, but is ever increasing and tending to broader and more thorough work.

The writer enjoyed the privilege of attending the meetings of the Dental and Oral Section, and found a body of men earnest and more intent upon the advancement of the scientific side of dentistry than they were of personal interests. This self-sacrificing devotion might, with great advantage, be manifested in other and more pretentious bodies.

The work of this section comprised many valuable papers, several of which seemed to attract the attention of the city press, large space being given especially to Dr. R. R. Andrews's views upon the dangers of tuberculosis through neglect of the teeth. If the section had done nothing more, the awakening of the general mind to this ever-present danger would have alone justified the meeting.

The attendance at the meeting of this section was not large, a fact to be regretted. This can, possibly, be accounted for by the general impression that membership is supposed to be confined to those having the medical degree, and therefore the mass of practitioners feel that they are not in touch with the section, however interested they may be in its work. The time has not yet arrived for the dental profession to closely affiliate with the medical, and this for many well-understood reasons not necessary to enlarge upon here. The fact remains, however, that this section, while composed of a body of strong men, cannot, as at present arranged, be a large organization or exercise the influence it should upon dentistry. It is possible, through a more liberal construction of its rules, to have this prejudice modified or removed altogether, but this must be left for time to determine.

The general work of the American Medical Association seemed to the writer to partake of the many objectionable features of all such organizations, including those of our own. The bringing together of some two thousand men in one body is not conducive to the best conditions, and the meetings at the Academy of Music were practically unmanageable. This was not wholly the fault of the president, whose voice was not equal to filling the large building,

but, apparently, to a lack of adherence to parliamentary rules, fatal to all large meetings. This was peculiarly noticeable whenever a question deeply affecting the interests of the body was up for consideration, and then the gathering presented more the character of a tumultuous political meeting than of a grave scientific body.

The impression received was that, while the work of the Association was admittedly of great value, much was lost by a subdivision into sections, as the members could not attend them all, and they returned to their homes with a very indefinite idea of what had been accomplished outside of their own specialty. This seems to be a grave defect, not compensated for by the privilege of reading the papers as they are published in the *Journal.*

It was demonstrated, in the opinion of the writer, that this national medical organization has nearly reached a period in its history when its methods of work will require modification, if not an entire change in procedure, and this is equally applicable to dentistry. It is doubtful whether this will be recognized as a fact by the general medical or dental mind, but it must be conceded that the best scientific work cannot find a congenial atmosphere in great numbers, or in movable organizations. Time will bring about its changes, and to this may safely be left the future solution of the problem, and that with the assured consciousness that, however popular present methods may be, there will come a period when these will be regarded as antiquated and valueless as a means of bringing forth the best work.

EDITORS NOT ALWAYS RESPONSIBLE.

There has recently been some very severe criticisms upon editors of dental journals for permitting certain advertisements upon their pages of a character injurious to professional interests and in direct violation of the code of ethics.

The objections raised to the advertisements in question have been justified by their character, and no reasonable opposition can be made to the resolution adopted by the Academy of Dental Science of Boston and published in this journal. The adoption of this is most satisfactory evidence that at least one society has had a watchful care that nothing shall appear unworthy professional character without due notice. If all dental organizations were

equally careful the standard of professional publications would soon be raised beyond criticism.

It, however, must be borne in mind that editors are not responsible for the matter that appears upon advertising pages. This belongs to the business side of journalistic work and with which they have nothing to do.

All well-arranged periodicals must be conducted upon business principles, or they will fail, a fact seemingly forgotten by those who are too apt to view only one side of a question. The editor is quite sufficiently burdened with the preparation of the journal under his charge, and cannot supervise the business portion, even if qualified for that work.

The question of the intermingling of trade with professional journals has been a bone of contention for many years, and, in the view of the writer, has not always been justly treated. The contention made by those who oppose all advertisements has been that these lowered the professional standard and should not be admitted to the pages of any well-conducted journal; that these should be confined strictly to professional matters. This, to our view, is not only unreasonable, but would, if carried out, be productive of great injury to the very profession the critics seek to serve.

In a recent article the writer sought to show that there were two sides to the dental profession, both equally important, and, while distinct, were essential to its true progress. The strictly professional and trade should not be permitted to overlap each other, but can, without detriment to either, work side by side, each a mutual help and each worthy of respect in its own particular line of work. If this view be the correct one, there can be no loss of professional respect to have both sides represented in the same journal. To have this requires care and discrimination as to the matter permitted to appear. This is, at times, a problem requiring a mind trained to view both sides of the question. As this quality is not always attainable, errors of judgment are possible and frequently occur.

There is another view to take of this matter, not always considered, and that is that the advertising pages of a journal are oftentimes, if not always, more valuable than the pages devoted to professional matter. The mass of dentists care more for these than they do for the subjects considered in the periodical. Those who live in large cities and surrounded continuously with the active elements of trade cannot appreciate the position of one practising

in a remote section, isolated from all connection with professional thought, rarely or never coming in direct contact with dental exhibits and depending entirely upon the illustrations of advertisers for his knowledge of improvements being made in dental mechanism. The trade side of journalism is to him the open door to progress, enabling him to continue in touch directly and effectively with his colleagues more favorably situated. More than this, these pages become part of the history of the period, growing more and more valuable as time passes on. The evidence of this is to be found in the fact that collectors of dental literature will not permit their periodicals to be bound without the advertisements, and those who have had occasion to look over old journals turn with more interest to the advertisements than they do to the text.

Is it not time, then, that this hue and cry against advertisements should cease, and in its place accept the broader view that progress cannot effectively be made by working entirely in one direction or in condemning the labor of others?

EIGHTY-NINE AND IN PRACTICE.

At the recent meeting of the Susquehanna Dental Association at Carbondale, Pa., it was very gratifying to the writer to meet Dr. Otis Avery, of Honesdale, Pa., and listen to a paper of marked interest from his pen. This will be found upon another page of the journal, together with a very faithful representation of one of the oldest, if not *the* oldest man in practice in the United States. The reading of the essay, combined with the intellectual and physical force of Dr. Avery, produced a decided impression upon the meeting, demonstrating that, properly conducted, the practice of dentistry can be made conducive to long and vigorous life in the same degree as other and, supposed, more healthy occupations.

The Susquehanna Dental Association furnished a most excellent programme; indeed, it proved one of the most interesting meetings the writer has been privileged to attend in recent years, and socially the most enjoyable. This was largely due to the able Executive Committee and the large-hearted hospitality of the members and the dentists of the locality, who spared no efforts to make every one feel at home and enjoy the beautiful country of which Carbondale forms a very important part.

OLD POINT COMFORT.

The chairman of the Executive Committee of the American Dental Association furnishes the information that he has secured a rate of one fare and a third from the railroads, on certificate plan, and has also had promised from the proprietor of the Chamberlin Hotel a reduction from their regular charge to $2.50 per day, besides freely offering all the conveniences required for the meeting and committees. It is presumed, although not known by the writer, that the same will apply to the Hygeia, where the Association of Faculties is advertised to meet.

The Chamberlin has been recently constructed with all the modern appliances which add so much to the comfort of guests.

THE DEATH OF DR. EMILE MAGITOT.

The death-roll of distinguished men in the dental profession has of recent years grown to large proportions, but the name of Dr. Magitot stands pre-eminent, and will pass down into dental history along with that of Sir John Tomes, the two leading scientific minds of the century,—the one in France and the other in England.

The work of Magitot has for so long a period been a part of the intellectual and scientific life of his profession that the dental world has ceased to regard him as belonging exclusively to France, for he had become a recognized authority throughout the world.

His interest in the progress of dentistry remained unabated notwithstanding his advanced age, and we find him in his later years active in the Stomatological Society of Paris, the name of which received his cordial endorsement, if it had not its origin in his active scientific mind.

Dentistry owes to France a large debt for its earliest and best beginnings, but among the brilliant galaxy of names that have adorned its history, in that country, no one will stand higher or be more frequently quoted, as the years go by, than the name of Magitot.

The interesting and appreciative tribute to his life and work, from the pen of Dr. Pietkiewicz, has been translated for the Journal, and will be found under the proper heading. It is worthy the man and the work of his unselfish life.

Obituary.

LE DOCTEUR MAGITOT.

The death of Magitot has been a great loss to science and a profound bereavement for stomatology.

At the last moment, the editors of this review, regarding me as the oldest and the most immediate of the pupils of our lamented master, who, in the intimacy of our intercourse, was at times pleased to call me the son of his scientific work, have asked me to express our common sorrow and to recall the part he played as an original scientist, both in France and abroad.

While still suffering from the shock of this cruel bereavement, I should not, at this time and in a few hastily written lines, know how to treat of Magitot's work in detail or according to its merits; but the readers of this journal must not be able to open it without finding in it at least a word of farewell to one who has been its editor from the very first, and who was the veritable founder of stomatology,—our master and our pride.

It is due to his labors, to efforts, indeed, steadily persevered in from the beginning to the close of his career, that he succeeded in making stomatology a special branch in the group of medical sciences and in pointing out its importance and scope; that he gave it a life of its own and created this great scientific movement in regard to a particular point of human investigation, which, before his time, had been almost entirely neglected, and the application of which to the public health had very often been abandoned to empirics and ignorant practitioners.

A convinced and fervent disciple of the doctrines of Auguste Comte and de Littré, an intimate pupil of our common master, Professor Charles Robin, he had gained from the principles of positive philosophy an ardent love of science, and had found in them an infallible guide for all his researches as well as an unfailing method for all his future labors.

Remaining at the forefront of laboratory work and practice, he pursued at one and the same time the two great methods of experiment and clinical observation, and thus prepared himself for the authoritative work that he was to do later on.

His first researches in anatomy and physiology, which were

published for the most part in Robin's journal, and which he was compelled at least partially to revise and modify with our dear master and friend Charles Legros, after microscopy and the methods of investigation had been perfected, secured for him admission to the Society of Biology, where he enjoyed the intimacy of Claude Bernard, Paul Bert, Berthelot, Vulpian, Pouchet, and so many other illustrious men, almost all of whom are now no more. This was also the beginning of those Saturday reunions, where, after the sessions of the Society, literary men like Edmond About, Sainte-Beuve, and Alexandre Dumas joined the scientists, while they were still under the influence of new discoveries, and sought from their discussions, as they were involuntarily but more familiarly continued around the table, those inspirations which for us have given value to their literary masterpieces,—admirable combinations of imagination and truth, in which the original severity of the subject was masked by the graces of form and the subtlety of inventive genius.

With a spirit thoroughly independent, broadly open to new things, and eager for all truths, he devoted himself with passionate interest to that study which of all studies touches us most closely, —the history of man; and he became one of the most active members of the Anthropological Society, whose president he was, after having been for a long time its devoted and indefatigable general secretary, as Broca had been before him, one of the glories of French anthropology, with whom he was also connected by close ties of friendship.

His anthropological researches, which were for him, as he said, a relaxation, were often the occasion for interesting studies of the comparative anatomy of the dental system or of the maxillary formation in prehistoric or later races, and he often turned them to profit in deriving from them ingenious suggestions or even practical considerations of great interest, as, for example, in his treatise on the anomalies of the dental system.

His works on maxillary cysts, on abscesses of the sinus, on tumors of the periosteum, and on phosphorus necrosis soon opened to him the gates of the Surgical Society, and some years later the Medical Academy conferred upon him the enviable and well-merited honor of an admission.

I have only a word to say here on the part which he took in founding the Stomatological Society, of which he has always been the president, and of which he was the soul and the glory to the last moments of his life.

A short time after the organization, still very precarious, of a dental staff in the hospitals, the number of physicians who occupied themselves with diseases of the mouth having slightly increased, and being apparently destined to increase still further, I asked him whether he did not believe that the time had come to unite in one body all those who shared the common bond of similar studies. He approved my project, and replied that, if we desired to found a society under these conditions, he would place his name at our disposal. After this I had no doubts of success. His name was the flag to which all were bound to rally who had any care for scientific interests or for their professional dignity.

In fact, a short time afterwards he assembled at his house those among us whose association was best calculated to establish our effort, and, under his influence, they became the original members of the Stomatological Society.

From that day on he, who had only promised us his name, consecrated to us the best that he had; he devoted to the service of the Society all his zeal for work, all his intellect, and all his strength. Without taking account of distance or fatigue, he more than once sacrificed well-earned and much-needed rest to preside at our sittings, to take part in our discussions, to render them more interesting and luminous, and to share with us the fruits of his long experience.

He struggled with an unconquerable energy against suffering and disease in order to come among us, and we have seen him at times almost overcome with illness, yet unwilling in his great desire to be one with us, to avow himself vanquished. Only for a few months had he been unable to preside over our Society. We all hoped to see him again at our head, when we learned that he had been suddenly stricken down.

Long since an invalid, he had never been willing to abandon the struggle for what he considered the truth. Struck with the dangers to which workmen in the match-factories are exposed, he devoted himself with his customary ardor to the study of the chemical evil, multiplying his published articles in the scientific and political journals, in order to attract to this question of public hygiene the attention of the authorities as well as that of the scientific world, provoking discussions, holding conferences even in other countries, in short, overworking himself with a self-forgetfulness which was bound to terminate, and which did terminate, fatally.

By the powerful and incontestable result of his work, Magitot

was the head of a school in the full acceptation of the word,—the head of a school whose profound and lasting influence has made itself felt both abroad and at home. Magitot's work includes not only his publications, treatises of undeniable originality and value, it includes also all the prestige which he gave to stomatology by his communications to learned societies and to the congresses of which he was a member, as well as by the scientific discussions in which he took such an active part. He was the head of a school in knowing how to draw around him pupils to whom he strove to communicate the sacred fire, and who, in their turn, have sought to spread abroad their master's trust, to pass the good word along, and again to make pupils who were at the same time his, and who would once more become instruments for the propagation of his truth.

Moreover, he was a pattern for all, and gave us a great example to consider. By his labor, his profound love of science, and his dignity, he won a universal name and reputation ; he attained the highest honors to which a physician can aspire, and secured for himself a place among those men who have made the close of this century illustrious.

Dr. Pietkiewicz,
Revue mensuelle de Stomatologie.

RESOLUTIONS OF RESPECT.—DR. FRANK ABBOTT.

At a special meeting of the Alumni Association of the New York College of Dentistry, held April 29, 1897, the following preamble and resolutions were unanimously adopted:

Whereas, In the wisdom of an all-wise Providence the Alumni Association of New York College of Dentistry is called upon to mourn the loss by death of our late professor and dean, Frank Abbott, M.D., therefore, be it

Resolved, That the death of our late professor and friend calls for expressions of esteem for one whose character was above reproach, whose undeviating justice and loving-kindness to all with whom he came in contact leave impressions that cannot be effaced, and whose influence for good, both in and out of his chosen profession, was immeasurable. One of the brightest lights of our profession has been extinguished, but its rays, sure and strong, will continue to illuminate while dentistry lasts.

Resolved, That this preamble and resolutions be placed in full upon the minutes, and that a copy suitably engrossed be presented to his bereaved family for whom we feel the sincerest sympathy.

W. D. Tenison.
B. C. Wash.
W. Chas. Gattschadt, *Chairman.*

F. T. Hannemann,
Secretary of A. A. N. Y. C. D.

PROFESSOR DR. MED. LUDW. HOLLÆNDER.

Professor Hollænder, one of the most distinguished of the German dental profession, died March 12, 1897, from arterial calcification and degeneration of the muscles of the heart.

Dr. Hollænder was born in 1833, and, after passing through the Gymnasium, began the study of medicine in Breslau, Würzburg, and in Berlin. After graduation he practised medicine for seven years in South Africa, and subsequently continued in the same line of professional work in Berlin.

In 1871 he began the practice of dentistry and continued in this up to his death.

Dr. Hollænder was the translator and author of several works, and in addition was a voluminous contributor to periodical literature. This gave him a wide reputation extending far beyond the limits of his own country. His death will leave a vacancy in dental circles in Germany difficult to fill.

Domestic Correspondence.

AN INCIDENT IN DR. GARRETSON'S LIFE.

New York, May 14, 1897.

To the Editor:

Sir,—The tribute paid to Professor Garretson in your May number, by Professor Guilford and others, called to mind a very pleasant incident in this connection that much endeared me to Professor Garretson. It came as a surprise to me.

In 1882 I had performed a very peculiar surgical operation before the New Jersey Society at Long Branch and an account of it appeared in the *Dental Cosmos*, contributed by the reporter of the Society, and greatly to my pleasure I received a congratulatory note from Professor Garretson. It was a kind and pleasant thing to do from a truly great man. He subsequently sent me an invitation to witness an operation by himself of removing a portion of the extreme end of the vertebral column with the surgical engine. There I met Drs. Agnew, Pancoast, and others of note, and lunched with them, feeling honored for such an opportunity.

This is my small tribute to his blessed memory.

G. ALDEN MILLS.

REPLY TO DR. C. N. PEIRCE.

TO THE EDITOR:

SIR,—In the June number of the INTERNATIONAL DENTAL JOURNAL appeared an article signed by Dr. C. N. Peirce. The resolution he publishes as having been passed by the Society was offered by him, but was defeated in the discussion. The official facts of the case are these:

The Odontological Society of Pennsylvania held a special meeting November 10, 1896, for the purpose of hearing the report of a committee previously appointed to investigate the election irregularity said to have been perpetrated at the Pennsylvania State Dental Society, at its annual meeting, held at Bellefonte last July.

The report as adopted by the Odontological Society would seem to clearly prove that an irregularity had been committed. According to the law of precedent of the Odontological Society, on request, I furnished reprints of the proceedings of that special meeting, which were unofficially circulated for the information of any member of the profession who might be interested.

As the Editor of the Odontological Society, I wish to state clearly that I prepared the document in question, that it is a true reprint from our proceedings.

The motion which was passed as a substitute for the one offered by Dr. Peirce, and which I seconded, merely requested the editor to publish a disclaimer for the Society of official responsibility for the distribution of the said pamphlets.

JOSEPH HEAD,

Editor of the Odontological Society of Pennsylvania.

CORRECTION.

PHILADELPHIA, PA., June 7, 1897.

TO THE EDITOR:

SIR,—There appears in the June issue of your journal, over the signature of Dr. C. N. Peirce, what appears to be a resolution adopted by the Odontological Society, at its May meeting. As I originally framed and presented the resolution adopted, I wish to state that its language as now printed by you is incorrectly worded and misleading in character. The resolution which I presented and which was adopted is as follows:

Resolved, That this Association request the editor (Dr. Joseph Head) to publish in the *Dental Cosmos* and in the INTERNATIONAL DENTAL JOURNAL a disclaimer of the responsibility of this Association for the issuing of the reprints of the proceedings of its special meeting, held on November 18, 1897.

In the interest of truth and fairness, may I not request that you either publish this letter or make the correction in the next issue of your journal.

Sincerely yours,
L. ASHLEY FAUGHT.

Current News.

AMERICAN DENTAL ASSOCIATION.

THE Thirty-seventh Annual Session of the American Dental Association will be held at Old Point Comfort, Va., commencing at ten A.M., Tuesday, August 3, 1897.

GEORGE H. CUSHING,
Recording Secretary.

NATIONAL ASSOCIATION OF DENTAL FACULTIES.

THE National Association of Dental Faculties will meet at Hygeia Hotel, Old Point Comfort, Va., Friday, July 30, 1897, at ten A.M. The Executive Committee will meet at nine A.M., Thurs-

day, July 29; persons having business with this committee will please present their papers at the first session.

By order of

JONATHAN TAFT,
Chairman Executive Committee.

B. HOLLY SMITH,
Secretary.

NATIONAL ASSOCIATION OF DENTAL EXAMINERS.

THE Fourteenth Annual Session will be held at Old Point Comfort, Va., commencing Friday, July 30, at ten A.M., and continuing in session Saturday, July 31, and Monday, August 2. The sessions will be held in the Hotel Chamberlin.

The hotels Hygeia and Chamberlin will give rates of $2.50 per day, two in a room; $3.50 per day, one in a room.

Fares on all the trunk lines one full fare and one-third, good for the sessions of the American and Southern Dental Associations.

The Old Dominion S. S. Co., Pier 26 North River, will sell excursion tickets, including meals and berths, $11.20, sailing every day at three P.M., from Thursday, July 29, using the name of the Secretary.

Let every State send its delegates!

CHARLES A. MEEKER, D.D.S.,
Secretary.

29 FULTON STREET, NEWARK, N. J.

NEW JERSEY STATE DENTAL SOCIETY.

THE Twenty-seventh Annual Meeting will be held in the Grand Atlantic Hotel, Atlantic City, commencing on Wednesday morning, July 21, and continue in session two days. Seventeen papers by eminent men will be read upon interesting topics pertaining to the profession. Clinics of every description have been provided; four large rooms on the ground floor available for exhibits, with one-hundred-and-ten-volt current for electrical exhibits.

Hotel rates $2.50 per day up. Accommodations for seven hundred guests.

Friends from the West and East, contemplating attending the

American Dental Association, will be able to attend this meeting and take the Old Dominion Line of steamers from New York, Thursday, July 29, three P.M., at an excursion rate of $11.20, of the Pennsylvania Railroad rate of one and one-third fare.

CHARLES A. MEEKER, D.D.S.,
Secretary.

NEWARK, N. J.

NEW ENGLAND ASSOCIATION OF DENTAL EXAMINERS.

On the evening of March 4 the members of the various examining boards of New England dined at the University Club in Boston by invitation of the Massachusetts board. At this dinner, and at a conference after it, sixteen were present, representing Maine, Vermont, Massachusetts, Rhode Island, and Connecticut. It was the unanimous vote of those present that a permanent organization be effected to promote the following objects: To secure, through the co-operation of the various examining boards of New England, a high and uniform standard of qualifications for dental practitioners, and, so far as possible, uniformity of legislation, as well as uniformity in the requirements of candidates. A committee, consisting of Dr. John F. Dowsley, Dr. George L. Parmele, Dr. D. F. Keefe, Dr. T. J. Barrett, was appointed to frame a constitution and to call a meeting for organization.

This meeting was called together at Boston, June 3, and representatives from all the New England States were present except New Hampshire. The constitution presented by the committee was, after some minor changes, adopted, and the following officers were elected: President, John F. Dowsley, D.D.S., of Boston; Vice-President, D. F. Keefe, D.D.S., of Providence, R. I.; Recorder, George L. Parmele, M.D., D.M.D., of Hartford, Conn. The time and place of next meeting was left to the officers.

THE

International Dental Journal.

Vol. XVIII. August, 1897. No. 8.

Original Communications.[1]

THE USE OF SILVER SALTS IN THE TREATMENT OF ROOT-CANALS.[2]

BY L. P. BETHEL, D.D.S., M.D., KENT, OHIO.

This paper will serve as a sort of supplement to the one presented at the American Dental Association last August. In that I cited the results of experiments with silver nitrate as a lining for minute root-canals (not a filling, as some have taken it), showing that the silver nitrate, acting on the albuminous matter, formed an albuminate that sealed the mouths of the tubules, which would prevent ingress of putrescent fluids. (Specimens were exhibited at your November meeting.) I stated also that, "the object of the experiments was to find a means of treating root-canals that are too small to admit a broach, those branching or tortuous, those in flat-rooted teeth, etc., where the insertion of a protecting root-filling is a matter of doubt. If such canals are thoroughly lined with nitrate of silver, and it penetrates somewhat into the tubuli, as it does, there will probably be no subsequent trouble, though the root-filling should prove defective; and, indeed, it is a question whether root-filling would be necessary at all in the smaller canals." (Many of these we are unable to fill anyway.) In the preceding paper I mentioned also that those experiments were only the beginning of

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[1] The editor and publishers are not responsible for the views of authors of papers published in this department, nor for any claim to novelty, or otherwise, that may be made by them. No papers will be received for this department that have appeared in any other journal published in the country.

[2] Read before the New York Institute of Stomatology, April 6, 1897.

a series in the direction of root-canal treatment. Since that time I have made some further observations.

Will silver nitrate, after being deposited in a root-canal, act as a permanent antiseptic?

Silver oxide being an inert substance, it seems reasonable to suppose that it does not. By way of experiment, a number of freshly extracted teeth were treated with silver nitrate cataphorically, and placed in sterilized test-tubes, where they remained one week. Each crown cavity was then filled with alkaline bouillon media and inoculated with a mixture of bacteria taken from a suppurating pulp and cultivated on glucose agar. These cultures were allowed two days to develop. Then from this inoculated media in each cavity I made a series of cultures on gelatin agar, glycerin agar, and glucose agar. All of the cultures, except the gelatin, were placed in the thermostat and kept at a temperature of about 37.5° C. (100° F.) for days, but no growth presented in any of the tubes, while the test-culture that I had made from the same tube of bacteria in bouillon had developed rapidly. This demonstrated that not only were bacteria within the tooth killed, but all those inoculated into the bouillon in the several cavities had been destroyed. After the bouillon media had been in the cavities one day it was found to be acid in reaction, although alkaline when inserted.

Why did the bacteria not develop? Nitrate of silver, uniting with the albuminous substance in the root-canal, forms a dense albuminate that must limit the action of the liberated nitric acid on the lime salts of the teeth. Then, during the application of the cataphoric current, the nitric acid will be attracted by the positive pole, being an anion, and therefore not driven into the tissues of the tooth like the metallic salt, which is a cation. So nitric acid will be found in the root-canal, and permeating the coagulum formed; then, when moisture is placed in that canal, the nitric acid passes into solution and we get an acid reaction. I think this explains why there was no growth of bacteria in the experiments just cited.

But Dr. Halsted, of Johns Hopkins Hospital, and Dr. Credé, of Berlin, Germany, have shown that when metallic silver is used as a dressing for wounds, "the products of the bacterial vitality oxidize the silver and enter into combination with the argentic oxide, forming argentic albuminates, which have strong antiseptic properties. It was found that the bacterial secretions entering into combination with the oxides are organic acids, pre-eminently lactic acid, and that the antiseptics which an infected wound, when dressed with the silver, generates of itself, is lactate of silver."

If these assertions are true, and practical experience seems to prove them so, it seems but reasonable to assume that, in case of subsequent infection of these root-canals treated with silver nitrate, as from an imperfect root-filling, etc., especially if the infecting bacteria be acid-producers, the acid excreted by the germs would enter into combination with the silver oxide lining the canal and form an antiseptic silver salt that would in turn destroy the bacteria that had gained entrance into the canal. That is, providing all conditions were favorable; but practical experience alone will demonstrate this.

For lining minute root-canals the seventy-five-per-cent. solution of silver nitrate has been used, as it is a more perfect conductor of electricity, and seems to penetrate the canals more readily than weaker solutions. For the larger canals, however, the twenty-per-cent. solution appears to answer all purposes. To determine the depth of penetration of silver nitrate into the dentinal tubules, a freshly extracted tooth was selected; remains of the putrescent pulp removed, the rubber dam was placed over the neck of the tooth, and the root inserted into absorbent cotton that had been placed in a rubber-plaster bowl and moistened with salt-water. The negative pole, or disk, had been laid face up in the bowl and the cotton packed over it so that there was perhaps an inch of moistened cotton between the cathode and the end of the root. Fifty-per-cent. sulphuric acid was pumped into the canal; the cataphoric current, twelve volts, was applied for a minute or two, using the negative electrode, or rather changing the wires at the binding-posts on the machine so that the platinum point would be negative and the disk positive; then the acid was neutralized with bicarbonate of soda and the canal rinsed with warm water and dried. Silver nitrate, twenty-per-cent. solution, was then pumped into the canal, the electric current applied (Wheeler's volt selecter) after reversing the wires so as to use the positive electrode, using twelve volts for five minutes, the electrode being of platinum wire and small enough to pass well into the root-canal. This detailed manipulation was carried out so as to conform as nearly as possible to the treatment of root-canals in the mouth, both for lining and for abscess. The tooth thus treated was allowed to dry out, and was then ground down and a microscopical specimen made. Various other specimens were made in this way and some from teeth treated in the mouth. (See Plates I. and II.) To get the full detail, these specimens should be seen through the microscope; but the microphotographs show the general appearance fairly well, except Sections 4 and 5, which should

be as dark as the others. It will be observed that a dense coagulum clogs the mouths of the tubules (see Fig. 1), and as we follow the line of the tubules towards the circumference of the root, this coagulum grows less and less dense until only a few particles of silver oxide are seen scattered along in the tubules, and beyond this the normal tooth-structure remains. The extent of penetration is not more than one-sixth the extent of the tubules. In Section 4, under the microscope, the coagulum appears denser than in Section 1, and under a higher power (see Fig. 6), the granules of the deposited silver oxide appear larger than in specimens where twenty-per-cent. solution has been used.

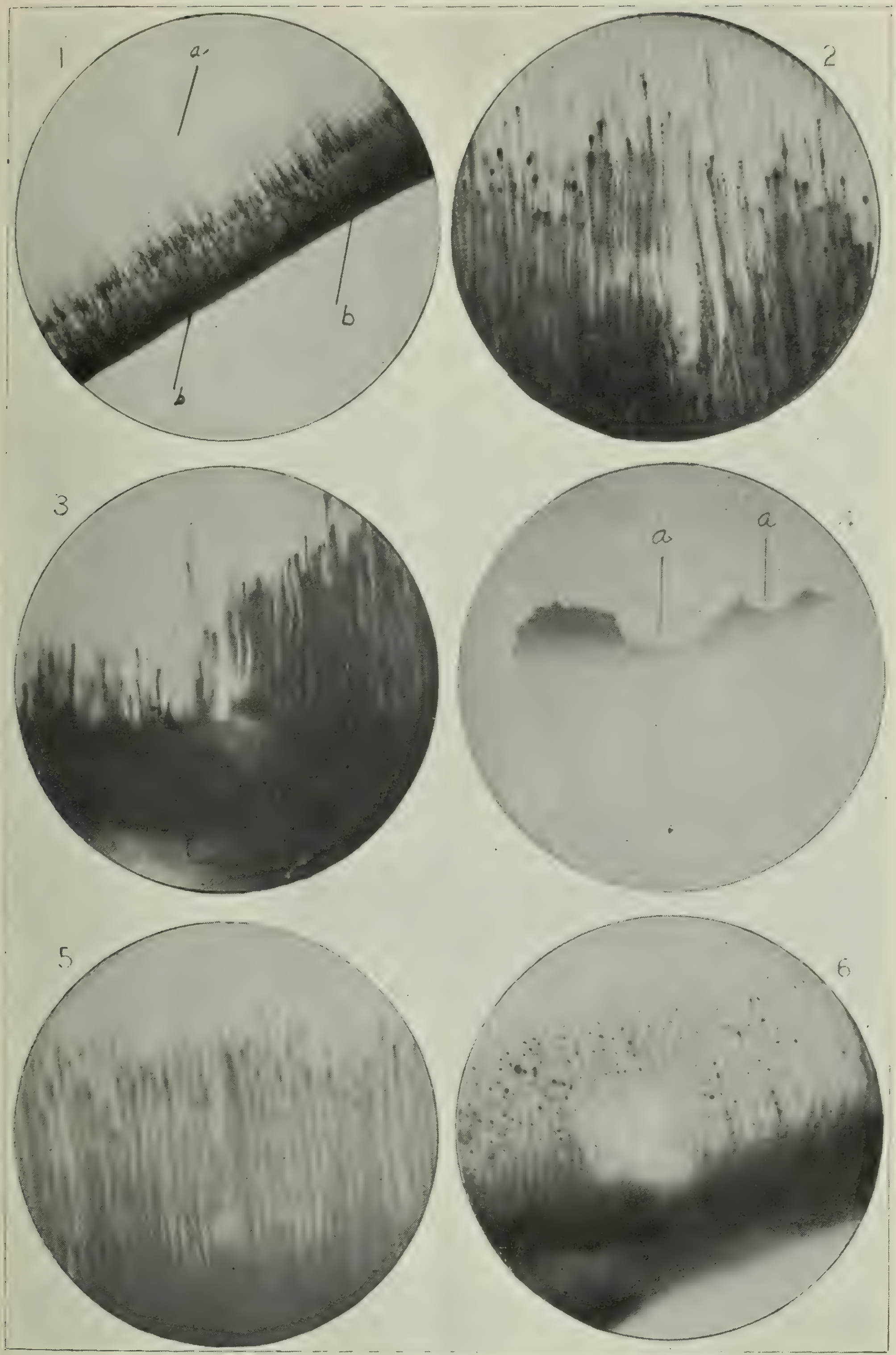
Fig. 7 shows the appearance of a lower third molar that was treated in the mouth and extracted two weeks later. The general appearance under the microscope is about the same as Section 1, under both low and high power, when the same lenses are used. The illustrations do not represent the same magnifying power.

Section 9 shows the result of an application of twenty-per-cent. solution of silver nitrate for five minutes, but *without* using cataphoresis. In this section we observe the usual discoloration and some penetration into the tubules, but the coagulum along the canal-wall is not so dark or dense, and the silver oxide in the tubules not so impacted as in the specimens where cataphoresis was used. The middle portion of this section shows the tooth-structure just below the canal proper, while portions of the canal and side-walls are seen near either end. The difference in the appearance of Sections 11 and 12 is much more apparent under the microscope. Where cataphoresis was not used (see Fig. 11), the coagulum looks spongy, and is not so dark and dense as in Section 12, where cataphoresis was employed.

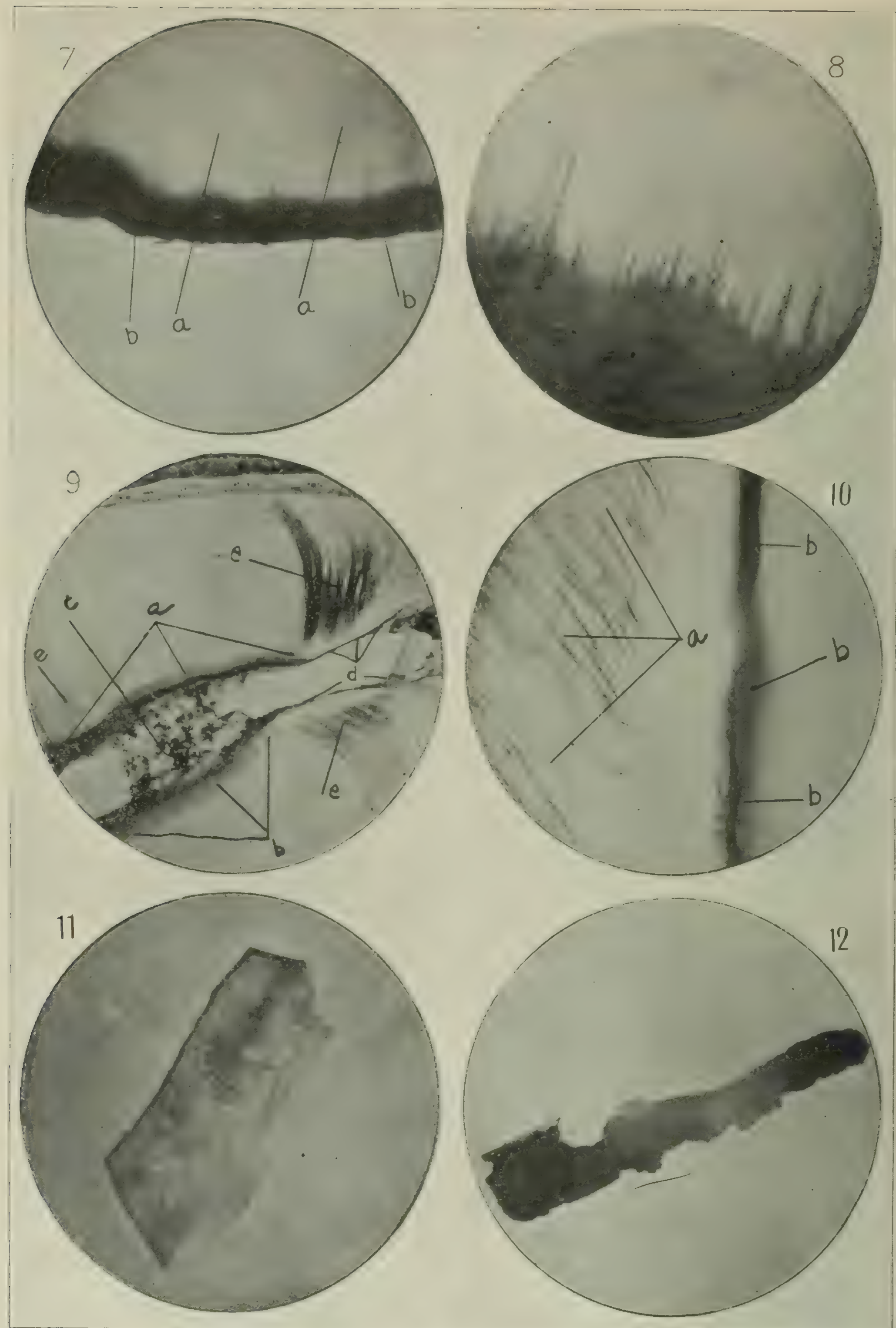
Some maintain that there is danger of forcing the silver nitrate through the whole extent of the tubules and causing injury to the peridental membrane. Perhaps this is possible if a very high voltage is used and the current applied for a long time; but in all of my experiments, and some have been with as high as forty volts, and in practical cases, I have not yet observed it. It is safe to affirm, I think, that this is impossible where from twelve to twenty volts only are used, and this seems to be about all the majority of patients can bear in root-treatment, and from four to five minutes time allowed.

In treating root-canals with silver nitrate, as much of the pulp as possible should be removed previous to the application, as the nitrate will then penetrate more readily. If small portions are

PLATE I.



1.—Section from root treated with twenty-per-cent. silver nitrate solution, applied cataphorically, twelve volts, five minutes *a*, dentine portion of section: *b*, *b*, line of surface of root-canal. Extent of penetration into dentinal tubes is one-sixth the length of the tubes. 2.—Appearance of Section 1 under a higher power of the microscope. 3.—Another portion of Section 1 under high power. 4.—Appearance of tooth treated with seventy-five-per-cent. solution silver nitrate, applied cataphorically, twelve volts, five minutes. Low power. *a*, *a*, portions broken out in grinding specimen. 5.—Appearance of Section 4 under a high power. 6.—Another portion of Section 4. High power.



7.—Section of lower third molar treated in the mouth and extracted two weeks later. Twenty-per-cent. solution of silver nitrate was used with twelve volts, five minutes. General appearance, under microscope, the same as Section 1. Penetration of silver nitrate no deeper. *a, a,* dentine; *b, b,* surface of root canal. 8.—Appearance of Section 7 under a higher power. 9.—Section from tooth treated with twenty-per-cent. silver nitrate solution, five minutes, without cataphoresis. *a, b,* extent of penetration of silver nitrate into the dentine; *c,* tissues just beneath surface of root-canal; *d,* line of action of silver nitrate; *e, e, e,* tooth tissue and *not* silver nitrate stain. 10.—Appearance of Section 9 towards apex of root. High power. *a,* tooth tissue shown at *e, e, e,* Section 9; *b, b, b,* action of silver nitrate along root-canal. No penetration of the silver nitrate into tubules at this point. 11.—Appearance of coagulum formed by twenty-per-cent. solution silver nitrate, without cataphoresis. Time, five minutes. 12.—Appearance of coagulum formed by twenty-per-cent. silver nitrate solution applied with cataphoresis, twelve volts, five minutes.

left, however, they are thoroughly destroyed; at least this has been my observation in experiments outside the mouth. In experimenting, whole pulps have been thoroughly disintegrated.

Let us turn our attention to the practical phase of the subject. In treating root-canals, either lining canal or treating abscess, the following method is now employed: Adjust the rubber dam, remove all noxious matter possible from the canal; apply, with broach, either pyrozone or fifty-per-cent. sulphuric acid, or both, as circumstances indicate. When sulphuric acid is employed, the current is used one or two minutes with the negative electrode in the tooth, for acids are anions, and are driven from the negative towards the positive pole. The acid is then neutralized with bicarbonate of soda; then rinse the canal with tepid water. This precaution is taken, for silver nitrate forms a precipitate with sulphuric acid and bicarbonate of soda. The moisture in the canal is taken up with a cone of bibulous paper or cotton, twenty-per-cent. solution of silver nitrate is pumped into the canals with a broach, then with the positive electrode in the tooth, for all metallic salts are cations; apply the current, usually about twelve or fourteen volts, for from four to five minutes, according to conditions present. If desired to protect the crown cavity from discoloration, coat it with melted wax.

I am indebted to Dr. Henry Barnes, of Cleveland, for the history of the following cases that have occurred in his practice. By way of explanation I might add that these are but a few of the cases Dr. Barnes has treated with silver nitrate, and they represent not the most favorable but those cases that seemed most unfavorable before treatment.

Case I.—Miss H. E., aged twelve. Very putrescent case of abscess in the inferior left first molar. Could not even place cotton in the tooth without causing pain. Had treated with all known remedies but without avail, then in desperation used twenty-per-cent. silver nitrate solution cataphorically, twelve volts for five minutes. Filled roots immediately. Case got well at once and has been in perfect condition ever since. This treatment was August 15, 1896.

Case II.—R. W. D., aged twenty. Acute alveolar abscess in right superior second molar. Removed remains of pulp-tissue, washed out canals with electrozone, dried with cotton pellets and hot air, applied seventy-five-per-cent. solution silver nitrate cataphorically, twelve volts (Wheeler's selecter) for five minutes. Roots were filled at the same sitting with chloro-percha and gutta-percha. No sore-

ness or after-trouble. Have treated three cases for this patient, all with acute abscesses caused by pulps dying under fillings. All were successful.

Case III.—Mrs. J. N., aged sixty. Inferior right first molar. Very putrescent condition of the affected tooth. Patient's health was not good and there was every indication of failure in treatment. Removed all putrescent material possible from root-canals, treated with electrozone, dried out, applied silver nitrate cataphorically, twenty per cent., for five minutes, and sealed the tooth. Soreness passed away and there was no after-trouble. Treated November 10, 1896.

Case IV.—Mrs. J. V. G., aged twenty-six. Case of putrescent pulp and blind abscess. Treatment the same as the others cited. In this case used seventy-five-per-cent. solution silver nitrate cataphorically. Filled root-canal at same sitting. Perfect success. No soreness or pain of any kind. Treated November 18, 1896.

Case V.—Mrs. N. S. W., aged fifty-eight. Putrescent pulp and blind abscess of superior right lateral incisor. The root was to be crowned. Treated with seventy-five-per-cent. solution silver nitrate cataphorically, and some was forced through the apex of root. Face in that location was swollen a little for two days but was not tender nor painful. Crown was applied four days later. No after-trouble. Roots and tissues have been in healthy condition ever since. Treated November 18, 1896.

In the following cases the nerve-tissue was not wholly removed from the teeth.

Case VI.—Patient, aged sixty. Inferior right molar tooth. Nerve had died under a large filling. Drilled into pulp-canal from buccal surface of tooth. Did not remove any of the nerve-tissue. Treated with oil of cassia for eight or ten days, but the tooth remained very sore and did not seem to improve under this treatment. Pus was still oozing out at the gum margins. In fact, it seemed as though the tooth was lying in a bed of pus. Nitrate of silver was used cataphorically and cavity sealed. Trouble ceased, soreness subsided, and tissues regained a normal condition. No further trouble.

Case VII.—Mrs. P., aged forty-five. Inferior right molar bearing a gold crown. Nerve died and tooth became very sore, but there was no swelling. Drilled through the morsal surface of the crown and was able to remove but a portion of the putrescent pulp-tissue. Treated several times with oil of cassia, but conditions did not improve. Applied twenty-per-cent. silver nitrate solution cata-

phorically. Trouble ceased, surrounding tissue became normal, and tooth has since given no trouble and is not at all tender on pressure.

CASE VIII.—Patient, aged forty-five. This was very similar to the last case cited. A portion of the pulp near the apex of root could not be removed. Treated with silver nitrate, twenty-per-cent. solution, cataphorically, and there has been no subsequent trouble.

In treating more recent cases, Dr. Barnes has adopted the method outlined in this paper previous to citing the cases. He has lost but one case treated with the silver nitrate, and this he believes was due to having used sodium peroxide in the canal previous to the application of the nitrate, not knowing at that time that the two substances are incompatible and that the oxide of silver would be immediately precipitated on contact with the sodium peroxide, and before the current could be applied. All other cases treated have been cured by one application of the silver nitrate.

Regarding the incompatibility of silver nitrate with other much used antiseptics, I have observed that it forms a black flaky precipitate with sodium peroxide, a white granular precipitate with sulphuric acid, a white cloudy precipitate with bicarbonate of soda, and a white coagulate-looking precipitate with electrozone. No precipitate occurs with pyrozone or peroxide of hydrogen.

Before testing for incompatibility I treated some teeth experimentally, out of the mouth, with sulphuric acid and then immediately applied silver nitrate without neutralizing or rinsing out the acid. Upon filing the root and exposing the canal there appeared to be a perfect white root-filling extending from the apex about one-third the length of the root. When this was moistened with water, however, it immediately became a pasty mass. It was the precipitate caused by the union of the sulphuric acid and the silver nitrate, and prevented the penetration of the silver nitrate into that portion of the root-canal.

Thus incompatibility may lead to failure, and it is prudent to take the precaution of ridding the canal of these incompatible substances by neutralizing, rinsing, and drying before the silver nitrate is applied, if the best results are desired.

Dr. Credé, of Berlin, Germany, has recently brought out two new silver salts,[1] the lactate and citrate, which give promise of proving valuable additions to the list of dental antiseptics. They are white, odorless, tasteless powders, stable when kept from action

[1] Can be obtained from Schering & Glatz, 55 Maiden Lane, New York.

of light. The lactate is soluble in the proportion of one to fifteen parts of water, and the citrate in one to thirty-eight hundred parts of water. Dr. Credé states that they have no irritating or corrosive action on wounds, are non-poisonous, and do not destroy cellular tissue. These salts do not form a black coagulum with albuminous materials as will the nitrate of silver. In fact, they form a very slight coagulum, if any, but when left for some time in contact with albuminous material there appears a slight light-brown discoloration. Solutions of these salts are only feeble coagulators of egg albumen. They form no precipitate with sulphuric acid, pyrozone, or peroxide of hydrogen, but with sodium peroxide a black flaky precipitate is immediately thrown down. With electrozone a white cloudy precipitate appears, and with bicarbonate of soda solution a light cloudy precipitate presents.

To determine the action of the lactate solution on instruments, a bur was placed in a solution one to five hundred. The day following there appeared a grayish-brown precipitate on the instrument, but it was readily wiped off and the instrument did not appear to have suffered any. After this test I began a series of experiments to determine the efficiency of the lactate and citrate as instrument-sterilizers; but these were not carried out, for I found that when steel broaches, the blued portions of excavators, and other unpolished steel came in contact with the solution, a smoky, black precipitate began forming from the surface of the liquid, and the unpolished steel was soon blackened. I determined, however, that instruments infected in a bouillon culture of staphylococcus pyogenes aureus, allowed to air dry, next placed in the lactate solution, one to five hundred, for one minute, then planted on various media, showed a growth after two days. One and a half, two, and two and a half minutes' exposure all showed a growth, but the four minutes' exposure showed no growth on any of the media, thus demonstrating it to be an efficient germicide.

During the past four weeks the lactate, one to five hundred solution, has been employed in the treatment of a number of root-canals, but the time is yet too limited to give accurate data regarding its use in this connection. I may say, however, that it promises to be an efficient remedy. One case, treated three and a half weeks ago, was that of an abscessed lower molar. The nerve in the distal root was putrescent, but that portion in the anterior root was partially alive. When opened, pus oozed from the tooth. The tooth was loose and very sore. The canal was cleansed in the usual manner, one to five hundred solution of silver lactate applied cata-

phorically, twelve volts for five minutes; then a pellet of cotton saturated with the lactate solution was placed in the root as a dressing, and the tooth sealed. Soreness disappeared, and the tooth became firm. When opened a week later to see the condition of the root, the cotton was found to be perfectly dry, and the canal also, but the nerve-tissue in the anterior root was still alive. Had the application been silver nitrate, it would have effectually destroyed that remaining portion of pulp-tissue. In another case the lactate solution was forced through the apex of an abscessed root. The abscess was cured, but the patient experienced a slight burning sensation, which lasted for an hour or two and then subsided. This, according to Dr. Credé, is a characteristic of the salt, for he says, "It has no corrosive or irritating action upon wounds, but sometimes produces in sensitive ones a more or less strong burning sensation, varying in duration from several minutes to several hours."

In the case just cited there was a pocket in the gum on the lingual side of the tooth, extending almost to the apex of the root, and from which pus was exuding. A dressing of lactate solution was placed in this pocket, and the patient dismissed. No discomfort was experienced from this application, and the gum-tissue gradually tightened and resumed a healthy condition.

I have not made use of the lactate in pyorrhœa alveolaris, but believe it merits our attention in this connection.

In case it be required, in special abscess cases, to disinfect the contents of an abscess sac, or other conditions about the apex, the silver lactate solution can be forced into the apical space and the canal then treated with silver nitrate, if desired, for solutions of the two salts are compatible.

What is the actual condition of a root-canal in a pulpless tooth, and what do we have to overcome in treating that canal? I feel that I should not take time to go into detail regarding this condition, for this paper has already exceeded the limit. A few words, however, may not unduly tax your patience.

We do not find decay in a root-canal having a putrefying pulp, for the reaction of putrefaction is alkaline, and an acid reaction (fermentative process) is required for disintegration of the lime salts, which is a necessary antecedent to decay.

If there is no decay in a root-canal, do bacteria penetrate the tubules, and, if so, to what extent? I took from my stock of decalcified teeth a large number of those having abscessed roots. Sections, both longitudinal and cross sections, were cut from differ-

ent portions of these roots, stained, and examined. In none of these was I able to find penetration of bacteria into the tubules, notwithstanding bacteria were present in the root-canal. Next, I selected a freshly extracted abscessed root. The crown had decayed almost entirely away, and the abscess on the apex of the root indicated a chronic case of long standing. By grinding this under water I was enabled to prepare a microscopical specimen of the entire length of the root-canal. (Unfortunately a good microphotograph of this section could not be obtained.)

Looking at this specimen with a low power, the surface of the canal appears irregular. With higher power the bacteria, stained violet, appear all along the length of the canal, in some places massed together, in others somewhat scattered, but conforming to the irregularities of the surface. No penetration of the bacteria into the tubules is observed until nearing the apex of the root, and here some have penetrated into the tubules to quite a depth.

It has for some time been a question in my mind whether the necessity for prolonged treatment, and, occasionally, failure to cure, were not due to failure in getting the antiseptic to the apex when applied as a dressing.

These, then, are the general conditions we meet in pulpless root-canals. What would be the result of an application of silver nitrate solution cataphorically to a root in this condition? It would combine with the albuminous bacteria, as well as the albumen in the tissues, to form in this location an insoluble albuminate, destroying the micro-organisms; it would penetrate into the tubules to a depth sufficient to destroy all noxious material, and then it would leave the mouths of the tubules thoroughly sealed. What more could we desire?

THE TECHNIQUE OF A TRANSPLANTATION.

BY LOUIS JACK, D.D.S., PHILADELPHIA.

Transplantation as introduced and practised by Dr. John Hunter was not attended by sufficient success to recommend it as one of the routine operations of dentistry. With the advent of antiseptic and aseptic surgery the attendant conditions and modifying factors involved in the operation have undergone such change that now the operation of transplantation may be viewed as a solution to hitherto insurmountable difficulties. For details of history and the general procedures, see article on "Plantation of

Teeth," in the proceedings of the Academy of Stomatology (INTERNATIONAL DENTAL JOURNAL, March, 1896). The operation in the light of contemporary pathology has a well-defined technique, which is the purpose of the present demonstration to describe.

The patient, a boy aged nine and a half, had the left upper central incisor fractured transversely at about the middle of the crown a year previous to this date (May 29, 1897). The pulp was killed by the traumatism, probably by thrombosis of its vessels. At a later period an abscess developed, which received appropriate but partially effective treatment.

Noting the age of the patient and by exploration, it became a clear inference that the process of calcification of the tooth was incomplete, contraindicating an artificial crown as a permanent and lasting feature, the operation of transplantation was determined upon.

The first step of the operation consisted in obtaining reliable guides for the preparation of the teeth to be transplanted. A plaster impression of the upper labial teeth was taken, from which a model was made. By means of a probe passed into the pulp-canal the exact length of the canal was obtained and recorded.

The plaster tooth was cut away, leaving at the gingival margins the exact neck outlines, an excavation was then made in the plaster to the depth of the measurement recorded as the length of the root.

The excavation was intended to follow the neck outlines of the tooth carefully, and to leave an external labial lamina of plaster to represent the outer alveolar wall.

With this prepared model as a guide an appropriate tooth had to be selected from the stock of natural teeth, which are considerately saved by Dr. J. D. Thomas for this specific purpose.

It will be observed that, although the adjoining central incisor is of unusual form, a tooth was found which closely matched it, the anatomical correspondence being almost complete, so that no alteration was required in its length or outlines. The plaster teeth were varnished, the natural tooth set in its plaster alveolus, and retained by packing paper at any opening to secure it.

Two dies of Babbitt metal were made, and two counter-dies for the rough die are poured, one shallow, the other as deep as the entire crown length. An accurate tin pattern was made, a piece of eighteen-carat gold plate, No. 30, was well annealed, bent upon itself to cover the cutting-edges of the teeth, and was lightly malleted to rough adaptation with the die, avoiding striking the gold over the cutting-edges of the teeth, as it could be readily

torn. Reannealed, the plate was set in the shallow counter-die, the die adjusted and swaged very lightly; both die and counter-die were covered with dampened tissue paper to avoid contamination of the gold. Reannealed and swaged between the perfect die and the counter-die.

The plate was formed to cover the lingual and labial faces of several of the adjacent teeth, including the transplanted one. The labial face of this tooth was permitted to be exposed at the upper half to reveal the gum-line and also slightly so on the lingual side for the same reason.

The plate was polished on the outer surfaces, but was left of dead finish on the inner side to afford better adhesion of the cement. It was also well to make a number of perforations at each end to increase the retention.

The pulp-canal of the tooth to be transplanted was opened throughout its length and reamed to almost the apex; it was then dropped in a three-per-cent. pyrozone solution, which disorganizes any decomposing organic matter present, and afterwards transferred to a one to two thousand solution of mercuric chloride. It should be remarked that any shreds of pericementum were scraped away as at least useless, and perhaps detrimental. After several hours immersion the tooth was removed from the sterilizing solution, its canal dried by means of wisps of bibulous paper, was filled with gutta-percha cones, packed tight; the opening upon the lingual face of the tooth was filled with gold. The tooth was returned to the bichloride solution, which, immediately before the operation, was heated to about 180° F.

All of the instruments used in the operation were kept in a three-per-cent. solution of hydronaphthol at a temperature of 200° F.

It was proposed to induce in the patient the initial stage of ether narcosis, that in which there is a transitory anæsthesia without loss of consciousness. The ether producing symptoms of nausea, local anæsthesia by refrigeration was substituted. A spray of ethyl chloride was directed against the gum until its edges were blanched, when the gum was detached from the neck of the tooth by means of a lancet, and the tooth immediately extracted. The mouth was then freely sprayed with the hydronaphthol solution, which was also used prior to the extraction. After bleeding was lessened the same solution of hydronaphthol was blown from an atomizer under the force of compressed air into the alveolus, this was continued for fully a minute.

The next step consisted of the partial decalcification of the

cementum. The process was not carried to the full extent described and recommended by Dr. Amoedo. An opening was made in a piece of rubber dam through which the root of the tooth was thrust to the enamel margins; the loose ends of the dam were brought over the crown of the tooth enclosing it, and protecting the enamel from the action of the ten-per-cent. solution of hydrochloric acid, in which the root was now immersed.

This removed any microscopic deposits of calculi which might be present upon the root, the superficial cementum was also slightly softened, forming the safest and most satisfactory scaffolding upon which the attaching tissue might be built.

The acid was neutralized by dipping the tooth in dilute ammonia water.

The tampon of cotton, saturated with the hydronaphthol solution, was removed from the alveolus, and the tooth inserted to test its position. The retaining cup was removed from the antiseptic solution and set in position, for assurance of accuracy of adaptation.

The alveolus and teeth were again sprayed with the forcible jet of hydronaphthol, napkins were placed in position, and the parts dried. A thin mix of zinc phosphate was made; the tooth for replantation was set in its alveolus, the cement was placed in the retaining appliance which was then quickly pressed into position, and held firmly until the cement was hardened.

The appliance is to be worn for six months, as absolute immobility is a *sine qua non* for the success of all of these plantation operations.

The above procedures of the stated case were carried out in the presence of the council and some other members of the Academy.—*Reported by* Henry H. Burchard, *Editor Academy of Stomatology.*

A DESCRIPTION OF SOME ENGLISH APPLIANCES.[1]

BY GEORGE F. GRANT, D.M.D., BOSTON, MASS.

Mr. President and Gentlemen,—In October, 1895, my friend Dr. W. Booth Pearsall, of Dublin, paid me a friendly visit. Our talk drifted to a comparison of methods in use by men of our respective countries for facilitating operations of different kinds.

As an outcome of this conversation, Dr. Pearsall kindly sent

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[1] Read before the Harvard Odontological Society, December 3, 1896.

some appliances to me which he had found useful in his practice, with a request that I give them a trial and report to him my impressions.

After a year of careful trial and experience with some of the articles, I find much pleasure in introducing them to the notice of this Society, believing that their merit fully vindicates Dr. Pearsall's claim that the American dentist has not the entire monopoly of inventive genius.

The first of these helps is a moulding-flask, an invention of Dr. Pearsall. You will readily see that, while it is simplicity itself as to construction and manipulation, its use insures the greatest accuracy in the swaging of plates upon dies cast in it. You will also observe that the whole force of the blow in swaging falls upon the apex of a cone, and at the same time less metal is required than is used in any other moulding-flask now before the profession.

The second on the list is known as the Lennox matrix. This little instrument has been especially useful to me, and I regard it a very ingenious and valuable matrix; it is the only matrix I have seen in which the band, owing to its form (a segment of a circle), must readily adapt itself to the contour idea in fillings and secure adaptation to the neck of the tooth upon which it is placed. It is also very firmly retained, and can be easily attached to all bicuspid or molar teeth if the directions as to accurate adjustment of the length of the band are faithfully observed. I have attached the matrix to a porcelain bicuspid, which, as you will perceive, presents about as difficult surfaces as are often found in the mouth; still it is firm.

Two other most ingenious and valuable devices are presented in the *collar-crown outfit* and the fusible metal base-plate. While my method of procedure in the making of collar-crowns does not permit of my employment of the whole of Mr. Lennox's device for that purpose, I am of the opinion that it can be used with the greatest satisfaction as a whole in securing perfect collars for crowns. I can, however, speak in the highest terms of the instrument designed for measurement of roots, which is a part of the outfit. I consider it invaluable for the purpose for which it is designed, and have never made a measurement by any other means since it came into my hands.

The fusible metal base-plate is an idea most skilfully developed. It can be produced in a short time,—within an hour from the taking of the impression,—and is accurate as to fit, reliable as to furnishing a sure, solid base upon which to obtain the occlusion of the teeth,

under the same conditions as practically prevail in the finished piece.

The directions which accompany the system are so simple that I will not take up your time in any description or elaboration of them, simply presenting this cast with wax base-plate duplicated in fusible metal, and the mould of King's modelling composition in which it was cast. You will see that every line and feature of the cast is perfectly fitted, and, so far as I am aware, there is no more perfect, practical method of obtaining such a result in use in our profession to-day. I will add that the fusible metal lends itself to many little uses, such as an aid in the hasty adjustment of retaining appliances in orthodontia, repair of plates, attaching teeth in rubber cases, etc. The fact that the crucible can be sufficiently heated in a vessel containing boiling water, enabling me to make a die directly from the impression, makes this a very valuable addition to both operating-room and laboratory.

I had omitted the statement that all these articles were kindly forwarded by C. Ash & Son, of London, through their New York house. I presume they would be glad to forward them to any member of the profession needing them on application.

I thank you for so kindly a hearing, and will be glad to answer any question or explain any point upon request of gentlemen present.

THIRD SET OF TEETH.

BY S. B. PALMER, M.D.S., SYRACUSE, N. Y.

An extract from an article in the June, 1896, issue of the International Dental Journal reads as follows:

"The Sunday *Herald* of Syracuse, New York, reports a case at considerable length of one James Slattery, of that city, who has apparently erupted late in life a portion of the full denture, with the prospect of more teeth presenting in the near future. Dr. S. B. Palmer, of Syracuse, made an examination of the case. . . .

"This seems the best attested report of third dentition we have met with on record, and it is hoped Dr. Palmer will secure testimony as to the character of the set prior to becoming edentulous through advancing years. The dental profession has regarded a third set of teeth as a myth, and with some reason, as most of the so-called third sets have proved, on investigation, to be simply delayed dentition of the regular second set."

The history of this case, together with facts which came under my own observation, and statements from Mr. Slattery himself, also from an unmarried daughter who had her home with him, I believe establishes a case of third dentition beyond a doubt.

James Slattery was born in Ireland in 1805. In 1832 he came to Napanee, Ontario, and two years later settled in Liverpool, near Syracuse, New York. He soon became a prominent salt manufacturer, owning his own plant. With the decadence of that once lucrative industry he, in 1867, removed to his farm and devoted himself to market-gardening. Mr. Slattery was a remarkably well-preserved man, and enjoyed robust health. When in his prime he was a well-developed man of six feet two inches, weighing two hundred and thirty pounds.

On mentioning the object of my call, I learned that he had carefully avoided notoriety, and had concealed the fact from his family as long as possible for fear that people would joke him about it, and would say that "Slattery was a baby and was just cutting his teeth." A moment's examination was convincing that the case was not a myth, and great care was taken in obtaining notes from which this report is a summary.

In the inferior maxilla were eight teeth located as follows: four incisors and two cuspidati, and two bicuspids on the right side. The cuspid on the left side and the second bicuspid on the right side were somewhat loose. The other teeth were firm, of usual size and length. They were somewhat overlapped from crowding. The color suited the age, which I attributed to smoking. The teeth showed no wear, as teeth with the use of seventy-five or eighty years would have done, in holding a pipe. He showed how he could do it by placing his pipe in his mouth and pressing it against his gums above. He said he could not do that for twenty years owing to the loss of his teeth. On the left side, in place of the two posterior teeth ordinarily found, were three parts of teeth resembling roots, having grown up partially out of the gums. They were not firm or well-developed teeth. The man insisted that they also appeared within the time mentioned, two years previously, and that they belonged to the same set. I am satisfied that they were roots belonging to the second set, which had been covered by the gums or had escaped his notice until attention was called by the eruption of the teeth already mentioned. The other portions of the jaw showed no signs of further eruption of teeth, as considerable absorption had taken place.

An examination of the superior maxilla plainly showed that the

third set, more numerous than those in the inferior, would soon make their appearance. The jaw was thick and full, nearly all the way back raising the lip and cheeks, giving the fulness peculiar to a child's jaw of six or seven years, or about the period of the eruption of the teeth of the permanent set. Mr. Slattery said his "jaws pained him very much; that the new teeth pricked the gums like needles," and "there will be a full set, except where I had a tooth pulled. I never had but one pulled, and a piece of bone came out with it. Now there isn't any tooth coming in there at all; that's the only vacancy, and that aint sore." I examined the "vacancy;" the depression was unusually deep owing to the growth of new process to support the incoming teeth. This closed the examination, and I intended to make another call in ten or twelve months.

Mr. Slattery died suddenly of disease of the heart, April 24, 1896, a little over eight months from the examination. I did not learn of his death at the time, but made two calls upon the family, from which I gained the following information: Having requested his daughter to observe developments, I believe her statements correct. The superior maxilla became painful, and the teeth erupted nearly at the same time with wonderful rapidity, so that before his death the upper denture was complete, with the exception of the place where the tooth was extracted. I asked as to the color of the teeth. She said they were yellow, much like the teeth of an old person. They were well developed. Soreness had abated and mastication was restored. I made inquiries respecting the teeth reported loose in the inferior maxilla. "They became firm like the others."

The *cause* of the crumbling away of the second set without severe pain, and that none were extracted save the one already mentioned, Miss Slattery could give no information.

That a man of robust health, and otherwise so well-preserved, should lose his teeth, and roots as well, calls for some constitutional change not usually met with. It could not be charged to pyorrhœa, because none of the teeth came out sound.

A patient whose teeth have been under my care for fourteen years or more are fast going in a like manner, giving little or no pain. He is a plumber, and has been for years engaged on soldering roofing and galvanized iron cornices, etc. He said the breathing of the fumes from muriate of zinc (soldering fluid) had destroyed his teeth. The case before us seems to bear upon the same principle, and it is reasonable to suppose that the manner in which the

roots came from the maxilla prepared the way for the conditions which followed.

Mr. Slattery was a salt manufacturer. For many years much of his labor was done in a "salt block." Evaporation was by boiling, and the warm vapor at times almost blinding. When not engaged in dipping salt from the boiling-kettles, the packing of moist salt was performed in an atmosphere highly charged with chloride of sodium.

The suggestions as to the cause of the loss of the teeth, etc., are my own. The history of the case as obtained from the family, with my personal observations, convinces me that nature gave to Mr. Slattery a third set of teeth as above described.

REMARKS MADE AT THE ANNIVERSARY DINNER OF THE AMERICAN ACADEMY OF DENTAL SCIENCE IN BOSTON, NOVEMBER 11, 1896.

BY JACOB L. WILLIAMS, M.D.

Mr. President and Gentlemen,—I am very glad to hear the pleasant allusion to Dr. Tucker, who was one of the original members,—in fact, both Drs. Tucker, Joshua and Elisha, were original members of this Academy.

In 1867 some half-dozen or more of us—I was then rather a junior member of the profession—met, and, after talking over dental matters, thought we would have a little society of our own, believing that there would be mutual advantages in combination and union on the principles of charity, tolerance, sympathy, and mutual confidence. We formed that society—about half a dozen of us—twenty-nine years ago; to-day there are more than one hundred members on its rolls in excess of the original number.

But that is not all; I am glad to see, and I congratulate the Academy on the fact, that the objects as implied by the name and the general tone of that combination have been perpetuated and have grown with its increasing membership,—the desire for knowledge and perfection in one's own work and the willingness to share one's ideas instead of keeping them secret, and, further than that, in the matter of ethics, willingness to give credit to an idea and to the individual who originates an idea, which in those days was not

so conscientiously considered as perhaps it is to-day. I remember an instance of this which has been touched upon this evening, and as it is a matter of history, there can be no harm in my referring to the subject again.

When Dr. Wells offered his anæsthetic to the Harvard Medical School he put up a notice in the Medical College stating that a *public* demonstration of the effects of this agent would be given on a certain day. Dr. Wells came, and the operation of tooth-evulsion was made on a patient while under the effects of nitrous oxide gas.

Dr. D. M. Parker, formerly a president of this society, was present and performed the operation, and has often asserted that the operation was as successful as the average under ether, although the subject, as is usual, made some demonstration, so that the students laughed at the matter and poor, modest Wells felt rather discouraged.

I can tell you in a few words the story of the origin and introduction of *ether* anæsthesia, about which there has been so much discussion; and I was in a position at the time to be thoroughly conversant with the matter. When it was first introduced I was a pupil of Dr. Keep. Dr. Wells had Morton as a pupil, and afterwards as a partner. Morton was inclined to extract teeth recklessly (as Dr. Cheever says he has formerly seen done), the main thought being to get out as many teeth as possible, as at that time he was doing quite a "business" in a kind of artificial work that was not held in high repute by the best members of the profession.

In a certain case where he wished to do something of this sort, he remembered that Dr. Wells had some knowledge of anæsthetics, and it occurred to him that if the patient by taking something could be put into a condition so that the teeth could be extracted without objection, he could have another case of that kind of business to do. So he went to Dr. Charles T. Jackson and asked if he could not prescribe something that would prevent pain in extraction of a tooth. Dr. Jackson was a man whose head was full of ideas that he was willing to give on application, and he recommended to Morton the use of sulphuric ether, which he had tried himself, at the same time giving him special directions for its use and cautions against carelessness. Morton took the idea and followed it as prescribed, with the predicted success; and having a plausible and persuasive ability, which is sometimes called the "bunco" talent, he persuaded Dr. Jackson to join with him and file a caveat

for a patent, which was done, thereby acknowledging Dr. Jackson's originality of the idea. After thinking the matter over more calmly, Dr. Jackson decided that it was an unethical thing to do, and he withdrew from his arrangement with Morton, saying that he would have nothing to do with the patent. Morton determined to go on with the matter alone, and to take for himself whatever profit and honor he could get from it, so he patented this prescription of Dr. Jackson's, and then went to the head of the staff of the Massachusetts General Hospital, the venerable Dr. Warren, and said that he had discovered a compound that would destroy pain in surgery.

It is to the credit of Dr. Warren that it can be said that, no matter what the source of an idea which was claimed to have merit, he stood ready to investigate anything which was declared to be of value in the practice of medicine or surgery. The staff did investigate, and proved Dr. Jackson's prescription for themselves; after dashing aside the veil of chicanery and the patent shackles in which it was presented to them, they had the credit of endorsing it to the world, and I think very justly the present hospital staff should have celebrated the fiftieth anniversary of their introduction to the world of that anæsthetic, although it did not take up two years before the suggestion of Dr. Wells,—viz., the production of temporary anæsthesia by the use of nitrous oxide gas.

At the Pan-American Medical Congress, held in Washington in September, 1893, I sketched in a paper some facts in regard to the origin of the application of anæsthesia in surgery, referring to Dr. Long, of Georgia, who had used ether in his private practice some years before, and Colton, who went about the country showing the amusing effects of nitrous oxide gas, from which Dr. Wells took the idea of using it for surgical anæsthesia, also to Sir Humphry Davy's long previous suggestion as to the possibility of doing something of this kind.

Now, the point is, whether the physician who originates an idea, or an ignorant nurse who carries it out, or the person who appropriates it, patents it, and calls it his own, is entitled to the credit that may accrue from the use of that idea? In ethics and by common law a physician has the credit and the responsibility for his prescription.

As I have stated, to the hospital staff belongs the credit of testing and endorsing to the world the value of Dr. Jackson's prescription, notwithstanding the false disguise in which it came to

them. These are the main facts of the case, and I was sorry not to see the physician, Dr. Jackson's, name who gave the original prescription introduced in the celebration.

This Academy has been fortunate in being composed, in the main, of members who have strictly conformed to the principles of ethics. I do not know of an instance where any of its members have obtained an idea at our meetings and advertised it to the world as theirs, and I trust we shall always be as fortunate in our members.

Then, again, the matter of saving teeth, which has been alluded to, we have also grown in that respect, and our studies and investigations have led us to consider the teeth as being valuable not only in themselves, but to the general economy.

At a meeting of the Oral Section of the American Medical Association more than a year ago, during a discussion of this subject, a suggestion was made by some speaker that physicians and surgeons were regardless of the value of teeth. I could not help getting up and saying that I had known that to be a fact in past years, but my acquaintance and experience had led me to believe that at present well-informed surgeons were fully cognizant of the value of the teeth and the importance of saving them, and that they paid vastly more regard to them than formerly (and this has been evidenced here to-night by Dr. Cheever's remarks); but, said I, we have to "look at home;" there are to-day many so-called dentists who have not yet conscientiously learned this important fact, and who still rake out and cut off useful teeth for the sake of putting in their artificial appliances. That work is still going on. I am glad to say that I do not think there is a member of this society who would not pronounce it malpractice to destroy a useful organ for the sake of having an opportunity of replacing it with artificial work. I often think in that respect of one of Dr. Holmes's poems which has always delighted me, "The Two Armies," and the lines which seem to express my own feeling in this matter run in this way:

"One marches to the drum-beat's roll,
The wide-mouthed clarion's bray;
And bears upon a crimson scroll,
'Our glory is to slay!'

"One moves in silence by the stream,
With sad yet watchful eyes;
Calm as the patient planet's gleam
That walks the clouded skies;

"Along its front no sabres shine,
No blood-red pennons wave;
Its banner bears the single line,
'Our duty is to save!'"

That, I think, represents the tone of this Academy, and I am glad to see it and hear it, and while one might expect it from the *personnel*, I still wish to congratulate the society on its present condition of advancement.

WHAT IS CALLED A BLIND ABSCESS?

BY DR. S. ALDEN MILLS, NEW YORK.

WHAT can we demonstrate? This question was given some thought not long since in this JOURNAL, and in reading the statement of Dr. Louis Jack in the June number of the INTERNATIONAL DENTAL JOURNAL, page 372, that "when there is a fistula and an open foramen, or where we can *safely* make a small enlargement of the foramen, the case is reduced to a simplicity," etc.

Many know how much Dr. Atkinson was severely scored for teaching the opening of the foramen.

In this connection it may be well to refer to an uncalled-for slur, made at Saratoga last year, which has gone into the proceedings of the American Dental Association. It was, doubtless, aimed to antagonize the views held by the late Dr. Atkinson. He did teach boldly that the foramen should be opened, and that the disturbed territory should be broken up and reduced to a simple wound. This teaching can now be demonstrated as successful practice in a large proportion of cases, and if all could be under control, the success would practically be universal. Passing through the foramen in this manner is not a difficult operation, if performed with the intelligence all should have at command.

To enter into an elaborate technical description of this operation is deemed unnecessary. Apply an obtundent to the part through which it is proposed to make an artificial fistula, and then puncture with any suitable instrument. It is folly to deny that good results are not obtained by this operation. This has been demonstrated times without number in the writer's experience.

CLEANSING TEETH.[1]

BY ALBERT H. BROCKWAY, M.D.S., BROOKLYN, N. Y.

I WAS asked not long since, by the publisher of a dental periodical, to give him for publication my method of cleansing teeth. As this seems to indicate an interest in the subject, I will set forth in brief my practice in this respect,—not assuming it to be different or better than that of others, but such as serves my purpose.

I will say, however, as an excuse for speaking on what may perhaps be considered a trivial matter, that I believe it is one to which many dentists give too little attention, and yet it seems to me that few of our operations are more generally beneficial or more highly appreciated by our patients.

In my own practice I make it preliminary to all other operations for several reasons: it familiarizes one with the character of the mouth and the condition of the teeth, and, also,—and this is important with timid or inexperienced patients,—it serves as an excellent and comparatively gentle introduction to the more severe operations which are to follow.

Having seated the patient in the chair, my assistant—a young lady, by preference, always—fastens around the neck a large napkin for the purpose of protecting the clothing from being soiled, often supplementing this with a light rubber apron if thought necessary,—a precaution much appreciated by fastidious persons.

Lightly smearing the lips and corners of the mouth with refined vaseline to prevent chafing, I then proceed with appropriate scalers to remove from the teeth every particle of tartar or other deposits, being greatly aided by my assistant, who holds back the lips and cheek, and illuminates the mouth with a small mirror or the electric lamp, frequently washing the loosened accretions with tepid water from a syringe. A few drops of listerine, or some of the analogous preparations, added to the water give a grateful, soothing freshness to the mouth, sweetening the breath, and rendering the operation more agreeable to all concerned.

My next step is to thoroughly polish all accessible surfaces of the teeth with a wheel-brush, of suitable stiffness, run by the dental engine, and charged with pulverized pumice-stone moistened with water or listerine. Should there still remain, as is often the case, persistent stains, I follow the brush with buffers or points of moose-

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[1] Read before the New York Institute of Stomatology, April 6, 1897.

hide, or rubber charged like the brush, and sometimes rendered more efficient by the use of a little tincture of iodine or peroxide of hydrogen. In extreme cases, where the stain is *very* persistent, I moisten the polisher with a drop of dilute phosphoric acid with much advantage.

All the exposed portions of the teeth having been cleansed and polished, there still remain the proximal surfaces scarcely touched, and these are extremely difficult to reach, especially if the teeth are in close contact. Having made sure of the possibility of getting at these with any polishing agent, however fine, by first passing thin metallic strips between the teeth, I then proceed to use fine tape or floss silk charged with the pumice-powder, drawing it back and forth with a sawing motion, and bending it around to reach every part of the proximate surfaces.

I am free to say, however, that for this part of the operation I have never found anything so efficacious and satisfactory as what is known and sold at the dental depots as dental fibre, or tucum, a tropical production said to be taken from the palm-leaf and charged naturally with silex like the cortex of a reed, and which, consequently, can be used either wet or dry. This is so fine and strong that with care it can be readily drawn between the teeth, however close they may be, and, given the proper motion, will quickly and effectively remove all stains, leaving the surfaces beautifully polished and clean.

Abstracts and Translations.

THE NEW ANTISEPTICS OF DR. CREDÉ: SILVER AND THE SILVER SALTS, AND THEIR USE IN DENTISTRY.[1]

BY M. HILLE, DENTIST, DRESDEN.

Though modern surgery has turned from antisepsis to asepsis, the former is by no means superfluous. Asepsis cannot be obtained in many conditions in which the external circumstances are such

[1] Read before the Dental Association of the Kingdom of Saxony, October 24, 1896. Abstracted from the Deutsche Monatsschrift für Zahnheilkunde, May, 1897.

that microbic infection cannot be prevented, or where it has already occurred. Moreover, antisepsis often gives us quicker and better results than does asepsis. Especially is this the case in the mouth, the field of our special labors, which is a perfect culture-oven of exogenous and endogenous micro-organisms, and where aseptic procedures are entirely inapplicable. We dentists are compelled to rely on antiseptics; and if I propose a new one to you, and recommend it most warmly, it is because of the good results that I have obtained with it in various departments of our specialty.

The ideal antiseptic must possess the following properties: It must be harmless, non-poisonous, and non-irritating; it must be fatal to all pathogenic spores and microbes; it must have no deleterious or destructive effect upon the tissues; it must be in a form that renders its application possible in the most difficult localities; and, finally, it should be sufficiently far-reaching in its effects to penetrate the deeper tissues and destroy the germs that may have penetrated to them. None of our previous antiseptics fulfil these conditions. Credé believes that two new ones, the citrate of silver and the lactate of silver, really do so; and his conclusions are confirmed by those of Halsted, Beyer, and others. His bacteriological and clinical experimentation in the Carola Hospital, of Dresden, have given most surprisingly good results.

We dentists are well aware of the fact that the precious metals, in proper form, hinder the growth of the schizomycetes; that gold fillings are more resistant and more durable than others. I, with Miller, ascribe it, in part at least, to this fact, though something may be due to the greater care with which fillings of the precious metals are made. Gold plates are better borne by the oral mucous membrane than those made of hard rubber. It seems to be proved that various metals, more especially mercury, silver, and gold, have antiseptic properties; whilst zinc, lead, and iron seem to be quite powerless in this regard. The laboratory experiments and clinical researches of Credé and Beyer were so entirely satisfactory that I resolved to try the new antiseptics in dental work. In the sterilization of root sinuses I thought that they would be specially useful. My trials were made upon teeth with freshly killed pulps, as well as upon those in which the pulps had become gangrenous, and include about one hundred cases. And I may state at once that my hopes were not disappointed. The results that I have obtained during the last half-year have been entirely satisfactory to me, and I can recommend these preparations to my colleagues in the very warmest manner.

I directed all the patients that I treated with the silver salts to return to me at once as soon as any pain occurred in the teeth that had been treated. Up to the time of this present writing only three have reappeared with periostitis; and in two out of these three the defects in the molars were distal, and difficult to get at.

My method of root-treatment is the following: I open the pulp-cavity with a suitable trephine and, if the pulp is gangrenous, clean it out as thoroughly as possible with a thin probe. Then I thoroughly and repeatedly inject out the root-canal with a freshly prepared and dilute solution (1 to 2000) of the lactate of silver. Then I apply the rubber dam and dry the cavity, first with cotton, and then with the warm-air injector, to the completeness of which procedure I attach the greatest weight. For I believe that even if dead nerve-tissue remains behind, further decomposition and the development of the gases of putrefaction cannot so readily occur if all moisture is thoroughly removed, and the mummification of whatever of nerve-tissue is left behind is effected. Here the powdered citrate of silver is of especial value, since it not only permanently disinfects the decomposition products that remain, but acts as a desiccant also in consequence of its powdered form. As is well known, the difficulty in the sterilization of the root-canals depends on the difficulty of thoroughly applying the antiseptic to it. I believe that it is best done by applying the citrate through an insufflator, to the nozzle of which a rubber tube with a very small orifice is attached; this permits the application to be made to all the sinuosities or even the distal canal.

The pulverization is fairly forcible, and, if the lumen of the canal is sufficiently large, I do not doubt that the particles of the drug reach the very ends of the sinuses. If the insufflator does not seem to have effected this, I apply the powdered citrate to the depths of the canal on a thin probe.

Recently devitalized pulps I usually fill at one sitting, simply dusting in the citrate after opening the cavity with a sterilized bur, and filling with tin or gutta-percha in the usual manner. When the root-canals are putrid, I deem it necessary to make two or three applications and insufflations of the citrate or the lactate before proceeding to the permanent filling. It is surprising to see, in most cases, that after the first introduction of the silver salt the odor of decomposition entirely disappears. I have seen no discoloration of the teeth in the cases that have returned to me; it is true, however, that they were all molar cases. Only the cavities were

colored black. Irritation symptoms after the applications were never noted.

I do not claim that this method of the treatment of roots is the only proper one; for there are almost as many different methods as there are practitioners of dentistry. But with these antiseptics I have formulated a suitable and effective system of treatment.

In conclusion, let me state that I have used the silver preparations in various other diseases. I have used the gray silver gauze in one case of empyema of the antrum of Highmore, and as a tampon for the hemorrhage following extractions, and also the dilute solutions as gargles in stomatitis, and I have obtained like satisfactory results with them.

The comparatively small number of cases over which my experience extends are too few upon which to base a final judgment. But the good results certainly enable me to recommend that these silver salts be extensively experimented with and tried by others, and I should be glad to stimulate those of my colleagues who have not yet used these antiseptics to do so.

CARBOLIC ACID AS A DISINFECTANT.

Nearly twelve years ago the Committee on Disinfectants of the American Public Health Association, composed of eminent bacteriologists and those interested in public health, made a report which, while it received wide-spread notice, did not receive the attention that its importance demanded. In this report they included the results of a long and careful series of experiments designed to determine the disinfectant or germicidal value of nearly all of the substances which are commonly used for the purpose of destroying germs, and it will be remembered that as a result of their labors we were confirmed in our earlier belief that bichloride of mercury, in proper solution and in proper surroundings, formed at once the most useful and powerful of all disinfectants. Also that, for the disinfection of large masses of material and for cheapness and efficiency, chlorinated lime, when freshly prepared and containing due proportions of chlorine, formed the next best disinfectant, and in many respects was superior to corrosive sublimate itself.

These same studies, moreover, proved beyond doubt, as have many subsequent ones made in other countries, that carbolic acid has a reputation as a germicide far above that which it deserves; that

the ordinary solutions of carbolic acid are almost useless as germicides, though they were active as antiseptics; and that it requires very many hours exposure to very strong solutions of carbolic acid to kill pathogenic germs. Notwithstanding these studies, however, and notwithstanding the fact that surgeons have for a number of years ceased to employ carbolic acid for surgical purposes to the extent that they did previously, the laity and some members of the profession seem to regard carbolic acid as the ideal disinfectant, and scatter it about premises and rooms in a manner which, while it assails the nostrils of the individual, does little towards protecting him from infection. Further than this, carbolic acid can be obtained at any drug-store in any quantity upon the request even of a child, and is generally sold without a question being asked as to the purpose for which it is intended. In other words, the laws regarding the sale of poisons do not include carbolic acid in the list of those which shall not be sold without a physician's order. Further, very few of the laity, and some of the profession, seem to be ignorant of the fact that carbolic acid, while it is a poor disinfectant, is, on the other hand, one of the most rapidly acting and lethal poisons known, capable of destroying life within a very few minutes after its ingestion, or of causing death later on by reason of the primary and secondary changes which it produces in the body. In 1892 we called attention to this fact in a leading article in the *Therapeutic Gazette*, our attention being once more called to the matter at that time by the report of four cases of carbolic acid poisoning in *The Chemist and Druggist* for that year.

Our attention has again been called to this matter by an interesting paper by Dr. J. Dixon Mann, professor of Forensic Medicine in Owens College, Manchester, upon "Some Statistics of Carbolic Acid Poisoning," which is published in *The Medical Chronicle* for December, 1896. After mentioning a number of facts which we have already spoken of and pointing out how frequently carbolic acid is handled carelessly and placed in the way of children and ignorant members of the laity, Dr. Mann publishes a table in which he shows that from 1885 to 1895 the total number of deaths from this poison in Great Britain among males was one hundred and seventy-six and among females one hundred and nine; fifty-two of the males were in children under five years of age, and twenty-six of the females were under five years of age. He then goes on to point out that carbolic acid stands fourth among the poisons by which death was accidentally or negligently caused during the ten years ending 1894, and if chloroform and lead, the first of which has produced

accidental death in a large number of cases and the second of which produces poisoning in the arts, are excluded, carbolic acid takes the second place among the poisons which have caused accidental death from personal carelessness or ignorance.

Again, Dr. Mann points out that in the ten years which we have mentioned one-fourth of the women who committed suicide by poison did so with carbolic acid, and it ranks second as a suicidal poison for males; while if the two sexes are taken together carbolic acid stands first of all poisons used for the purpose of committing suicide. It is also interesting to note that the number of people who commit suicide by means of carbolic acid has rapidly progressed each year: thus in 1891 there were 63; in 1892, 73; in 1893, 117; and in 1894, 167. He also mentions two cases in which carbolic acid was used for the purpose of committing murder, the victims being children; and two cases of manslaughter also occured.

Finally, he sums up the facts that during the ten years we have named 917 deaths were due to carbolic acid, an average of nearly 100 deaths; and that in 1894 the number of deaths from this cause reached the appalling total of 202.

Dr. Mann urges, therefore, what we have previously urged, that a restriction should be put upon the sale of this violent poison; and we doubt not that an examination of statistics in this country would give conclusions nearly identical with those obtained by Dr. Mann from a study of the statistics in the United Kingdom of Great Britain.—*Editorial in Therapeutic Gazette.*

Reports of Society Meetings.

THE NEW YORK INSTITUTE OF STOMATOLOGY.

A REGULAR meeting of the Institute was held Tuesday evening, April 6, 1897, at the residence of Dr. J. Adams Bishop, 30 West Forty-eighth Street, New York City.

In the absence of the President, Dr. Allan, Dr. J. Morgan Howe was nominated as chairman, and acted as such.

The Secretary read the minutes of the previous meeting, which were approved.

The Chairman.—Gentlemen, we will first listen to Dr. A. H. Brockway, who will read a short paper on "Cleansing Teeth."

(For Dr. Brockway's paper, see page 507.)

Dr. Brockway.—I will say that at the request of Dr. Lord I brought over with me the instruments I use in scaling teeth, although there is nothing original about them. They are parts of several sets. I make great use of Riggs's scalers. I know that many object to them, but I would rather forego the use of any other scaler than Riggs's. Considerable practice is required, however, before one can use them satisfactorily. I had them two or three years before I had much confidence in using them. I have also parts of Dr. Allport's set, and Dr. Howe's set, and also some of Dr. Lord's, I have here, too, some of the fibre which I mentioned. If it is not familiar to all present, it ought to be, as it is one of the most useful things I know of. It is also admirable for polishing fillings.

DISCUSSION.

Dr. F. Milton Smith.—I would like to ask Dr. Brockway what his method is for reaching the deposits that are sometimes found three-quarters of the way down on the root. It is utterly impossible for me to remove those deposits entirely with scalers.

Dr. Brockway.—It is sometimes extremely difficult to reach all the deposits. I do not know that any of us can always do it, but with the instruments I have shown here I manage to do it with a tolerable degree of satisfaction. The Riggs instrument is as efficient for going deep down as any I know; but I make great use of a delicate chisel-shaped instrument, bent slightly,—one or two degrees only; with that I can feel my way down, and if there is any accretion present, I can usually discover it by the sense of touch and remove it. I have not made use of solvents, trichloracetic acid or sulphuric acid, as some do, but it may be well to do so.

Dr. Babcock.—I have used the dilute aromatic sulphuric acid, and have found it very beneficial. I have also used the trichloracetic acid, but did not find it as valuable. The aromatic sulphuric acid, in connection with a little tincture of capsicum, acts also as a stimulant, and where the gums are loose and inclined to bleed and be turgid, this preparation seems to accomplish a great deal, using it after the thorough mechanical removal of the deposits.

Dr. Houghton.—In place of pumice-stone I use Arkansas stone powder, which gives a fine finish and removes the discolorations

and deposits much more effectually, in my opinion, than pumice-stone. It can be obtained from any of the jeweller supply-stores down-town. For the last few years I have had a dread of the use of the brush-wheel in cleaning teeth. Those who have a practice in which they can obtain almost any fee they ask, can use a new brush-wheel for each patient. In my estimation, there is no more dangerous source of infection than the brush-wheel. If I do use one a second time, I always soak it in electrozone. The brush comes out beautifully white, clean, and pure. I prefer above all things the little rubber cups in polishing. The other details Dr. Brockway mentioned meet with my hearty approval.

Dr. W. St. George Elliott.—I think most gentlemen have an erroneous impression as to what pumice-stone will do. Many people have the idea that this material is rough, and injurious because it has that feeling. Pumice-stone, while it appears to be rough, has no great amount of hardness, and one can take it on the finger and polish glass with it and it will break down into an infinitesimally fine powder and do no damage. The teeth can of course be injured by hard and injudicious brushing, but I do not think I have seen any very great injury done in that way. I use the very stiffest brush I can find, particularly in the treatment of Riggs's disease, using the brush more on the gums than on the teeth. Take any case where the gums are in a bad condition, and they can be put into a fairly healthy one by using only the brush without any medicament. Nature intended the gums to sustain the teeth and stand up under the most severe work. Civilization has given us soft food, and the gums do not do as much work as they should; they have become inflamed and do not perform their proper function.

Dr. Z. T. Sailer.—Does Dr. Elliott mean the friction to be on the edge of the gum or the part that covers the process? If the brush be pushed against the gingival edge resting upon the teeth absorption will follow. I can understand the philosophy of rubbing the gums hard over the process, but not over the edges of the gum, where they come in contact with the teeth.

Dr. Elliott.—I neglected to say that (in accordance with the custom of most present probably) when I instruct a patient to clean the teeth, it is always with a rotative movement, commencing high up on the gum, and brushing towards the cutting-edge, this after having thoroughly gone over the palatine surfaces, commencing with the lower incisors.

Dr. Bishop.—I agree with what Dr. Brockway says about

cleaning teeth. I think we can get along without many medicaments. A good brush in a patient's hands will do more than we can. I recommend the stiffest brush that can be made. It should be made short and stiff to thoroughly clean the mouth. The teeth are the hardest material of the body, and they come up through the gum which Nature has beautifully finished around them, but which must be kept clean, and that must be done mostly by the patients, and they must have an instrument with which they can do it. Every patient I have asks, usually, "How shall I keep my teeth clean?" I tell them they have not brushed their teeth properly. My instruction is to take a dry brush before retiring, and to use it with a rotating motion to get out what food remains. No injury will be done to any mouth with a stiff brush properly used. It should be made very short, so that it will roll and reach any place in the mouth. It keeps the festoon of gum clean, and during the hours of sleep comparatively little harm can result.

Dr. Lord.—I do not understand how these gentlemen can say that they have never seen any harm come from the use of the brush. I have seen teeth brushed to death,—that is, the teeth became furrowed by too frequent use of stiff brushes, and not unfrequently the gums brushed away from the necks and roots of the teeth. I have sometimes thought it would be just as well if brushes had never been invented or used, as they are depended upon for cleansing the teeth in order to prevent decay, which they will not do, at least to any considerable extent. We hear persons say that they cannot understand how or why their teeth decay, for they brush them two or three times a day. They do not seem to realize or understand that there are other and more efficient means of keeping the teeth clean, particularly those surfaces which are most liable to decay. Of course, we need to use a brush say once a day, not oftener, with a little soap and an impalpable powder, that the teeth may be kept clean and polished,—more for appearance than otherwise. I prefer tooth-powder in the form of tablets, used by crushing them between the teeth and kept in the mouth until the mass becomes a paste, and then placed on the brush with the tongue, not wetting the brush. I have liked very much a preparation of chalk called velvet chalk, which comes in balls and should be used in the same way as the tablets.

It is most important that we should thoroughly teach our patients how to keep the teeth clean, for this we know is the most efficient means of preventing decay, and we should explain to them the reason why.

It is my practice to pass an instrument between all the teeth, however close or tight they may be together. This may readily be done with an instrument prepared for the purpose, and with it I use pulverized pumice-stone to polish the proximate surfaces. This allows the floss-silk to be used with ease and comfort, which is really the only means of cleansing the contact surfaces when the teeth are tight together. When there is more or less space, folded tape or an untwisted cord of suitable size should be used, so that the spaces may be kept clean and the sides of the teeth polished.

Dr. J. F. D. Hodson.—I wish to antagonize what Dr. Elliott has just said. I have seen very serious trouble produced upon the teeth, and upon the gums as well, that I am very sure was caused by the brush, and nothing else. I am decidedly of the opinion that both the teeth and gums are in many cases *scrubbed* too much, patients often boasting that they spend half an hour in the process each time of brushing their teeth. It is of all things what I would *not* have them do. I point out to them that the *oftener* they brush them the better they will please me, but that, after conscientiously going once or twice over every part of every tooth, they have arrived at a point where good has ceased and harm commences. It is the commonest of things in one's experience to see the roots uncovered by this vicious scrubbing process, particularly those of the exposed cuspids, and the practice being continued on the soft dentine, producing concavities that soon become cavities, and finally unsightly fillings. It is bad enough when we must have this state of things to endure as the result of specific erosion,—the *bête noire* of every conscientious operator. It is, I am persuaded, unjustifiable to allow patients to deliberately produce it mechanically. If my patients have any extra energy to dispose of, I beg of them to give it to flossing the approximal surfaces, and often say to them that if they slight one of the two things, the floss or the brush, slight the brush by all means, as the surfaces touched by the brush are all more or less taken care of by the forces constantly at work in the mouth,—*e.g.*, the action of mastication, of the lips, cheeks, and tongue, aided by the washing effect of the flowing saliva, etc.,—but that the most dangerous places, the approximal spaces, which are needing the most of artificial care, not only receive none from the brush, but are actually further burdened by the brush sweeping more material into them.

Dr. Elliott.—There seems to be a good deal of difference of opinion among us, but if the matter be looked into closely, it will be found that we are all of one mind. I did not say that the brush

was not capable of doing injury if injudiciously used. I have seen injury that may have come from the brush, but that is an injudicious use of a good thing. If properly used, it is impossible to do damage with it. We often see the gum pushed away from the teeth, but that is not as dangerous as the loosening of the teeth would be, because, even if there is a recession, the tooth can still be retained in good condition. So it is really a difference in the *modus operandi.* The point that to me is important is that the gums do not get enough work to do, and we should make up for that by stimulating them with a stiff brush.

Dr. Hodson.—I do not think I ever saw inflamed gums—barring, of course, those due to constitutional causes—that were not so as a a legitimate consequence of underlying tartar. Upon a thorough removal of this cause—an operation, by the way, which is seldom given the exhaustive attention which it merits—the gums tend at once, and spontaneously, to a healthful condition. I do not recognize any inherently diseased condition of the gums from non-work *per se.* As well might we say such a thing of the mucous membrane lining the maxillary sinus, or the nares, or anywhere in the whole tract where it is spread over a bony foundation, and so in corresponding circumstances with that in the mouth.

Dr. McNaughton.—Is tartar not always preceded by a little inflammation of the gums?

Dr. Elliott.—Feed a dog on soft food for three months, and examine his gums, and then put him on hard food, give him bones, etc., and in another month you will find an improved condition.

Dr. Hodson.—It is a case of restored health.

Dr. Elliott.—Restored health from use.

The Chairman.—We will now hear from Dr. W. St. George Elliott, the chairman of the Committee on Current Literature.

REPORT ON CURRENT LITERATURE.

Dr. Elliott.—Certainly the harmonious relationship of the human features is not only worthy of the deepest study, but should receive that recognition from the entire profession to which it is entitled. There are, no doubt, fixed laws which control the size and shape of the teeth, their relationship to the features and temperament. Unfortunately, these laws are but little understood by us, and so a contribution on the subject is always welcome. Dr. Norman Broomell has given us in the January *Dental Cosmos* a very interesting paper on this subject most beautifully illustrated.

Dr. Broomell, unfortunately, does not in this paper give any

practical points to govern us in our work. This, no doubt, he may be able to do at some future time. The main object of the paper is to make us familiar with the four great types of temperament, the bilious, the lymphatic, sanguinary, and nervous, and having fully recognized them in our patients, to make such use of the knowledge in artificial work as will lead to a satisfactory and artistic result. It may not be an exaggeration to say that ninety per cent. of the prosthetic work we meet with shows either gross ignorance or a flagrant disregard of the harmonious laws of nature. I would say just here that I believe, as a rule, the profession are not to blame for this; the fault lies with our patients. I remember some twenty-five years ago being consulted by an elderly lady who wished to have a partial upper denture made. The few remaining natural teeth were sufficient guide, I thought, to enable me to construct a plate that would have teeth in harmony with her features. On completing the case I thought myself entitled to some commendation for the results; but, on giving the patient the mirror, what was my surprise when she said, "Oh, those teeth will not do; they are like horses' teeth; my teeth were small and white;" although I had the evidences to the contrary before me. Some patients are honest enough to tell us that when they are getting new teeth they might as well have nice ones.

Dr. Barrett, of Buffalo, read an excellent paper on a similar subject before the American Dental Association, at Saratoga, last summer, treating the subject from an anatomical point of view, showing the necessity of allowing proper play to the oral muscles, and so making the denture that it will not interfere with the muscles of expression.

Dr. Weld's paper before the Odontological Society appears in the same number of the *Dental Cosmos*, and we have had some chemical demonstrations at the Dwinelle. Briefly, the chemico-metallic method consists of filling root-canals with a broach made of silver, tin, and zinc. This is oxidized by the application of aqua regia or its equivalent. This oxidation, together with the generation of gas and the change in the canal contents resulting from the chemical action, sterilizes the root, while the alloyed broach acts as a filling. In 1875, and subsequently, I used fine copper wire, without acids, for this purpose with fairly satisfactory results, but soon abandoned it for the same reasons I would be inclined to criticise Dr. Weld's method,—*i.e.*, the practical impossibility of so gauging the length of the wire as to just fill the canal and no more, although I recognize the possible value of the chemical combination.

Dr. Farrar has a short article in the January number of the *Dental Cosmos* on some points in the specialty he has done so much for.

It is his belief that in the correction of protruding upper teeth the teeth swing upon their middle part, the fulcrum being a short distance above the necks of the teeth, and sometimes the roots in moving forward move the upright plates of the maxillary bone. This is a very interesting point, and I hope Dr. Farrar will give us some proof of it. I certainly think he is mistaken. He also states that "the generally accepted impression that considerable extra space in regulating can be gained by widening the dental arch is erroneous." I think he is mistaken. It is a common practice in London for dentists to use the Coffin expansion plate in the first stage of regulating to gain the required space; indeed, I have known them to correct slight irregularities in this way alone, the teeth correcting themselves when liberated from lateral pressure.

Naturally, Dr. Farrar with his experience believes in the advantages of extraction to facilitate regulation. I remember Dr. Norman W. Kingsley showing me a case many years ago that he had successfully regulated, taking some two years, and stating that he subsequently found that he could have accomplished the same thing in quarter of the time had he had recourse to extraction at an early stage.

Dr. Register, of Philadelphia, read a paper before the Pennsylvania State Dental Society, in which he takes up the investigations of Drs. Black and Miller as to the cause of caries, and gives us some valuable tables of the comparative durability of his own operations with gold, alloy, and phosphate. Dr. Register deserves much credit for his honesty in giving us this table, for most of us would not like to tell our patients that our gold fillings only averaged 7.73 years and amalgam a little over five. I fancy it is nevertheless true, if, indeed, they last so long.

Dr. Black in his investigation of the comparative hardness of different teeth, if I remember aright, distinctly states that by hardness he does not mean resistance to cutting-instruments. One can readily conceive a tooth to be strong under compression, rich in inorganic matter, and yet its molecules so loosely held together that they do not resist cutting-instruments well. Terra-cotta and porcelain may stand compression well, but there is an immense difference if they are cut into. Consequently I infer that when micro-organisms are once located on a tooth, the rapidity of decalcification by acid secreted by the organism will be found to be in direct propor-

tion to the hardness, as judged by cutting-instruments and not by the proportion of lime-salts.

In *Welsh's Monthly* there is an article by Fletcher, of Warrington, England, a criticism on Dr. Black's article on "Amalgams." It seems that Dr. Black in one of his analyses gives the amount of mercury squeezed out to the second decimal. Fletcher contends that the amalgam is of no value, as the mercury was not mercury, but an alloy containing an excess of that metal, which is doubtless true. He states that an excess of mercury having been added, the squeezing out of the so-called mercury made the results so erratic that it was entirely discarded by him at an early stage. No more mercury should be put into an alloy than is necessary for proper working, which can be either wet or dry.

In the March number of the *Dental Digest* Dr. Black replies to the editorial comment on his article on the proper shaping of approximal fillings. It will be remembered that in Dr. Black's paper he advised the cutting away of the entire approximal surface down to the gum, so that the margin of the finished filling will be as far removed from the centre of the approximate space as possible, for the purpose of making it self-cleansing by the motion of the tongue and the food. Dr. Crouse in his criticism had stated that the preparation of the cavity and filling and finishing when conscientiously performed must consume from four to six hours of time, independent of that taken in securing the necessary space, besides requiring an amount of skill and good judgment not possessed by the majority of operators.

Dr. Black in his reply reiterates his statement, and believes that when dentists possess a clear apprehension of the principles involved, bold cutting upon definite lines is something quite different from feeling one's way to possible sound margins, and is done in much less time and with less worry to the patient. As to the cost of such operations, Dr. Black says the best is the cheapest in the end, costing less than several less efficient measures.

In the March number of the *Dental Cosmos* we have one of the most interesting and important papers that has been published in a long time. It is the paper by Dr. Leon Williams, of London, on "The Pathology of Enamel." I had the pleasure of hearing the paper read and seeing the lantern illustrations. No paper written on this subject seems to have advanced our knowledge of caries of the teeth to the same extent. Briefly stated, Dr. Williams proves by his illustrations that caries is the result of acid generated by a patch of micro-organisms lying on some protected surface of the

enamel, the organisms themselves following in the line of decalcification. He also shows that the chemical or physical formation of the tooth has but little to do with the frequency of decay; that defective tooth-structure *per se* is not necessarily the point of attack by these organisms; that the teeth of animals, as shown by the slides, are often defective in structure and yet do not decay.

Dr. Bryant, of Washington, describes an excellent combination, consisting of a gold plate solidly attached to the natural teeth and yet removable; upon this gold plate a continuous gum plate is attached by means of a bolt and nut and gutta-percha. The whole is removable by the patient, and in case of fracture the two parts can be readily detached.

In the March number of the INTERNATIONAL DENTAL JOURNAL the editor, Dr. Truman, has something to say in regard to serrations on our pluggers. From personal experience I think he is right in his views, that at first we had very shallow serrations, then coarse, and now again shallow, and I think some of our young men should make some experiments to determine the scientific facts. My own belief is that sharp serrations should be used on the body of the filling, not necessarily coarse but sharp, and that near and on the surface fine, shallow serrations only should be used. I have seen many fillings destroyed by a lack of cohesion at some point, which would not have occurred had suitable serrations been used. I do not believe it is the serrations that produce pitting, but lack of condensation.

A gentleman came to me some weeks ago for a simple biproximal filling. That filling was knocked out twice within three weeks, and in each instance pieces of the gold had detached themselves, one from the other, until finally I used very coarse serrations, and then I found that I was not relying on a property of which I was ignorant,—that is, the cohesion of the gold.

In the *British Journal of Dental Science* there is a short article by Dr. Rosenthal, I suppose of Liége, Belgium, on the treatment of pyorrhœa by silver bands. He found out accidentally that the bands exerted a most beneficial influence, doubtless on the theory that the metallic salts, the result of chemical action on the silver bands, act as germicides, and being always present the effect is permanent. A theory worth trying.

Dr. Rosenthal, many years ago, introduced a cure for alveolar abscess. He brought it over to London, and finding that I had a suitable ejector, that gave a vacuum of about twenty-one inches, he came to me, and we gave a demonstration at my office. It con-

sisted of an ejector for getting the exhaust and a syringe with a three-way cock. With the ejector in the tooth and a bit of wax to make it air-tight, he would turn the faucet and exhaust all the air. A medicament would then be thrown in, the faucet turned again to exhaust that, and so on as many times as desired. He presented me with the apparatus, but I did not find it practicable.

DISCUSSION.

Dr. Lord.—I think we may get a great deal of interest and instruction of one kind and another from the reports of the Committee on Recent Literature, calling our attention to certain articles and giving some suggestions in regard to them. Perhaps if we had read the articles we would give them a second reading, and if we had not read them, we would be likely to look them up.

I have read Dr. Black's paper alluded to in the report, and I certainly felt a great deal of regret and disappointment that a man of his intelligence should advance such views; they seemed to me simply absurd.

I was greatly interested in Dr. Crouse's criticism of the article in question. It did only justice, and is calculated to be very useful. The terms which I use may seem a little harsh, but such views coming from a man of Dr. Black's intelligence seem dreadful and are likely to do much harm.

The chairman of the committee, in reporting on prosthetic dentistry, said that sometimes he thought failures were not due to the dentist so much as to the patient. It has always been my feeling that dentists should not consult their patients, at least not to much extent, in regard to the detail of artificial dentures. The dentist ought to know a great deal better than the patient in regard to the color, expression, and everything connected with the fitting or adaptation for the greatest usefulness; we cannot trust our patients to decide those questions.

Dr. Brockway.—I am glad to see this practice introduced, of having a summary from the dental journals prepared for us at the meetings. I have long been of the opinion that it was a source of information and instruction that societies were very remiss in not improving. It is almost impossible for us to read all the journals; many of us are not able to afford them all, and often we have not the time to read them; but if we can have a review and selection from the various journals presented at our meetings, it will be a source of very great advantage.

The Chairman.—We will now listen to the paper of Dr. L. P.

Bethel, of Kent, Ohio. The subject is "The Use of Silver Salts in the Treatment of Root-Canals." The photomicrographs of the specimens sent by Dr. Bethel were kindly made for us by Dr. Andrews, of Cambridge, and they will be thrown upon the screen in illustration of the points of the paper.

The Secretary read Dr. Bethel's paper.

(For Dr. Bethel's paper, see page 485.)

DISCUSSION.

The Chairman.—Gentlemen, Dr. Bethel's paper is now before you for discussion.

Dr. E. A. Bogue.—The subject for consideration this evening must interest us all, and as I read the discussions on this same subject in our recent literature, there are a few points upon which clear pronouncements have not been made.

When we speak of treating a root-canal, we are not apt to carefully specify that this is a canal in which a pulp spontaneously died and lay dead for from one to five years, without a suspicion on the part of its possessor as to its real condition, until an abcess had begun to form at one or two of the apices of the roots, accompanied by extensive pericemental inflammation. Similar inaccuracy may be expected if the pulp died from the effects of an oxychloride of zinc capping, and was found, to the surprise of the operator, atrophied, when he, by chance, opened into the pulp-chamber.

A third condition that might be in the mind of one who described the process would be that of a pulp-canal from which the pulp had been extracted piecemeal, so far as it could be reached, and the rest (in blissful ignorance on the part of the operator, generally not so blissful on that of the patient) left, because it could not be reached or because it was supposed it could do no harm.

A fourth description of a pulp-canal would be one whose pulp had been destroyed by the application of an escharotic, like arsenic, for example, which had been allowed quietly to rest for ten or twelve days, until the slough between the dead and living portions had taken place, and then, before disintegration had ensued, the pulp had been entirely removed.

Now, as I conceive, these four conditions are quite different and would require different treatment.

The questions arising about the use of coagulants would naturally present themselves, if one were contemplating the treatment and filling of the two conditions last described,—because if albuminoids in any shape are to be met with and taken account of in

our treatment of root-canals, one would expect them to be found either where the pulp had been wholly removed through the operation of an escharotic and its consequent slough, or when the pulp had been picked out piecemeal as far as our instruments can reach and the remainder, with the processes leading into the dentinal tubes, left.

In the case of the second root described, where atrophy of the pulp had taken place, we have the organic contents of the dental canal and dentinal tubes present in as nearly a mummified condition as may be.

While in the first-described roots we have a mass of putrefactive decomposition, probably saturating the dentinal tubes from a quarter to a half their length, and we have the denuded apex of the root from which the pericemental covering has been stripped by the processes of a forming abscess.

In the *Transactions of the American Dental Association* for 1896, Dr. L. P. Bethel presented a paper on lining root-canals with nitrate of silver by cataphoresis that has interested me much, and the discussion upon that paper is equally interesting.

Dr. Bethel, I judge, means to start from a point at which all soreness or tenderness of the teeth or roots, to pressure, has ceased. He also leads us to suppose that he has washed out the canals and rendered them as clean as washing can make them. Then he carefully states that the object of his experiments is to find a means of treating root-canals too small, or tortuous, or flat to admit a broach, and where it is doubtful about inserting a protecting root-filling.

Dr. Bethel leads us to infer that our ordinary root-fillings that we put into the six front teeth, some few bicuspid roots, and the palatal roots of the upper molars, and others that are accessible, are efficient, and he modestly presents a method that was entirely new to me of treating and filling or lining the inaccessible roots, for it seems from appearances that this cataphoric driving of nitrate of silver into a tortuous root containing certain organic matters results in a decomposition of the surplus of the silver salt into metallic silver on the one side and an insoluble substance on the other, the product of the chemical union of the salt with the organic matter, and that these very small roots are filled. I say this about the metallic silver from what I have read and been informed, for I have not seen the specimens. But one has only to read the abstract of Dr. Credé's paper in the February number of the International Dental Journal to see the action of the in

fected products of bacterial life upon silver; if, then, lactate of silver is so easily generated as is shown in that paper, we see that we have in Dr. Bethel's method not only a mechanical filling which seems the best adapted to prevent the entrance of septic matter, but that if there is a minute mechanical plug of metallic silver, it would in the presence of an infected condition generate lactate of silver, the powerful antiseptic that in a watery solution of 1 to 4000 destroys all bacteria within ten minutes.

Dr. Bethel in his paper thus calls attention to a fifth classification of roots needing to be treated and filled,—viz., roots too small, thin, or tortuous to be reached by ordinary methods. He then proceeds to give us a method of both treating and filling these minute roots. But he *nowhere* recommends silver nitrate in solution as a good thing with which to treat or line any of the six or eight front teeth. Nor does he say that because silver nitrate will not discolor teeth save superficially when applied as a caustic externally, where the branchings of the dentinal tubuli are smallest, and where the currents so far as we know are centrifugal, therefore it must be superficial in its action when applied in the pulp-chamber in solution at the trunk ends of the dentine tubes, and with the electric current behind it.

Dr. Elliott.—Some months ago I procured some of the lactate of silver and used it in half a dozen cases. With me the cases were all unfortunate.

Dr. Davenport.—I move a vote of thanks to Dr. Bethel for his paper and for the slides which he prepared for its illustration. Also allow me to include Dr. Andrews, of Cambridge, who has so kindly photographed the slides for use this evening.

Carried unanimously.

Adjourned.

S. E. Davenport, D.D.S., M.D.S.,
Editor The New York Institute of Stomatology.

ACADEMY OF STOMATOLOGY.

A regular meeting of the Academy of Stomatology was held March 23, 1897, at the rooms of the society, 1731 Chestnut Street, Philadelphia, the President, Dr. James Truman, in the chair.

Dr. H. C. Register, chairman of the Clinic Committee, made a report, including his "Method of Operating."

Dr. W. A. Capon gave a report of his clinic, exhibiting the preparation of a "porcelain jacket," as follows:

The case presented was a lady with deformed lateral incisors, commonly called "pig" or "rice" teeth, perfectly sound, with pulp healthy; the bite unnatural through extreme prognathism; the lower incisors closing completely outside of the upper, thereby enabling me to give undivided attention to the crown alone. With such cases very little preparation of the tooth is required. Simply grinding both lingual and labial surfaces slightly flatter and short enough to leave room for thickened cutting-edge of porcelain. After this procedure the circumference of the tooth was taken with wire, the same as for gold cap, and the size cut from platinum plate, gauge 30, and bent in tubular form, joints lapped and soldered with pure gold. This tube was fitted to extend slightly under free margin of gum, and should be quite as long as the tooth. While the tube was in position I marked the outline of adjoining teeth on its surface to indicate the final shape. The lingual portion was ground to this line and then reinforced by soldering another piece of platinum of the same gauge to that surface. The labial surface was then ground sufficiently thin to allow of burnishing to the tooth, reducing the tube to a hollow wedge. This part of the operation is quite the most important and, I may say, the most difficult to perform, for on it depends the future of the crown and probably the operator's reputation with that particular patient. The platinum frame was then placed in position and a thin porcelain veneer adjusted on its surface and held by porcelain body. The whole was then gently drawn from the tooth and dried, ready for the furnace.

After fusing, the crown was tried in its place and found slightly prominent, which fault was easily remedied by grinding the surface. More body was then added to overcome the shrinkage of first baking and to give the crown its proper shape, then fired for the second time, giving the porcelain a uniform density and surface, restoring the original gloss destroyed by grinding.

After polishing the metal portion the crown was cemented in position, thus completing a crown natural in appearance, durable, and extremely applicable in this instance. No other crown can *artistically* overcome such deformities and still retain original form of the tooth, with pulp intact, unless it would be a gold cap,—and would that kind of an operation be a remedy?

The platinum was ground to form instead of cutting, so that a better joint is secured. The great heat in fusing would melt the

solder from a flush joint and leave a crevice when finished. The same reason is advanced for lapping the joint when making tubes.

The furnace used was the Land "midget," one of the original gas furnaces, and still unexcelled for quickness and convenience, requiring only five minutes to fuse continuous gum body from time of lighting.

Dr. H. E. Roberts gave a clinic on the bleaching of teeth by the use of pyrozone, aided by cataphoresis. The case was a lady with both centrals and the left lateral incisor badly discolored, the teeth having large approximal cavities. After having removed all decay and wiped out the cavities with a fifty-per-cent. solution of sulphuric acid, neutralizing the acid with bicarbonate of soda, three pieces of platinum wire were twisted together, allowing one end of each to be loose; these were put in the canals and tied there so that the bleaching could be carried on in all three at once. Then a twenty-five-per-cent. ethereal solution of pyrozone was diluted with water, the ether was allowed to evaporate, and the aqueous solution which remained was used to saturate the cotton which had been placed in the canals, the current turned on and gradually brought up to thirty volts, being kept there for one hour, when the lateral was found to be so much improved that the wire from it was taken out and placed in the other side of the left central, making two contacts in that tooth. This was allowed to remain about one-half hour longer, when the electric current was cut off. Cotton saturated with the pyrozone solution was then sealed in the teeth and allowed to remain for two days, when the teeth still showed a greater improvement.

Dr. Gilliams paper on "Some Dental Manifestations of Gout" followed.

(For Dr. Gilliams's paper, see page 441.)

DISCUSSION.

Dr. Darby stated that he had seen so many similar cases that it seemed to him pyorrhœa must be associated with the gouty diathesis, although in some cases of calcic pericementitis and erosion gout is not evident, but there seems to be a strong probability of manifesting itself at a later period; also in very aggravated forms of gout there may be an entire absence of dental trouble, as an instance, a lady who was suffering from an inherited case of gout, and who for years had been compelled to be under a rigid anti-gout treatment with but partial relief; but, fortunately, she was entirely free from pyorrhœa alveolaris.

Dr. Register.—I believe pyorrhœa to be a manifestation of the gouty diathesis, having had personal experience in the matter, entailing the loss of a lateral incisor; although most authorities credit the young with being free from pyorrhœa. I have a patient, fifteen years of age, presenting that condition, and whose family history shows gouty tendencies, his father having died from rheumatic fever.

Dr. Roberts.—Gout may manifest itself in many ways, and although there may be no other symptoms than that of pyorrhœa, I believe some time there will be other indications of a gouty condition.

Dr. Jack.—I would like to ask if any one can assign a cause for the receding of the gums and the absorption of the alveolar process when there is no evidence of a calcic deposit or inflammation of the parts?

Dr. Truman.—There is apparently a condition frequently met with, and as often overlooked, that seems to answer the description of Dr. Jack's query. It is recession of the gums without any of the symptoms of pyorrhœa.

This is not confined to old age, but may present at a comparatively early period, from thirty to thirty-five. In a case coming under his care, at the latter age, all the teeth were more or less affected by resorption without any of the ordinary signs of pyorrhœa. On examination, microscopically, of one of the teeth thrown out by the destructive degeneracy of the tissues, it exhibited a nearly complete eradication of the tubulated structure. So marked was this that the section presented the appearance of a transparent plate of glass. The question of calcification of the inner tubular tissue was then in warm dispute, and as it was difficult to determine the cause of the obliteration of the tubuli, it was left then without explanation. The only reasonable conclusion, however, is that the teeth had become practically foreign bodies, and were thrown out as organs incapable of proper nutrition. Senile dentine—dentine of old age—may and doubtless does produce the same effect.

Dr. William H. Trueman.—There is always a tendency for teeth to assume their proper position in the arch; so I want to particularly commend Dr. Roberts for his remarks about waiting until we are sure nothing further can be gained by delay. The tendency of teeth to return to their former position is a very serious condition we must recognize in regulating, and unless they can be fixed in the new position our labor will be lost.

Dr. Register.—I want to commend Dr. Roberts for the valuable suggestion he has given us in his method of regulating; it is unique, simple, easily constructed, and efficient.

Dr. Gardiner.—I have seen most of the cases of Dr. Roberts for the past seven years, and I cannot but express my pleasure in the way he handles his cases of regulating.

Subject passed.

Adjourned.

J. HOWARD GASKILL,
Secretary.

HARVARD ODONTOLOGICAL SOCIETY.

A REGULAR meeting of the Society was held on Thursday evening, December 3, 1896, at Young's Hotel, the President, Dr. Waldo E. Boardman, in the chair.

The President called upon Dr. George F. Grant to give his "Description of some English Appliances."

(For Dr. Grant's paper, see page 497.)

Dr. Grant.—The appliances that I am going to present to you to-night are the outcome of a visit from a friend of mine about a year ago, a dentist who was taking a little vacation from his practice in England. We sat down and compared notes, and each told of things which he thought might interest the other, and some of the things that he mentioned he said he would send over that I might try them.

The first one is a little matrix, called the "Lennox matrix." It is a very ingenious little thing and is quite simple. I cannot say that I have handled all the matrices that have been in use, but I can say that this is the best and easiest to handle of any that I have yet tried. Take a straight band matrix and it never fits a tooth, but this one, being cut on the segment of a circle, fits almost anything. I will pass one of the bands around, bent in position to be applied. All of these have a little mark, a black line, that corresponds to the form of the circle, so that when the band enters the lug there the strain is in a line with the form of the tooth, and by simply turning up the screw it fits at once. The matrix is so thin that it will pass between almost any teeth.

The next thing is some of the uses of fusible metal. Everybody who has had artificial work to do appreciates the difficulty of getting a base-plate which has some approximation to the finished

plate. I do not know of anything which can be used with perfect satisfaction as a base-plate that can be prepared quickly, whereupon he suggested and sent to me what is called "King's modelling outfit." The process is very much like ours, except that fusible metal is used directly from the modelling composition. Of course, you have your model, which may be simply a wax pattern, but with a little knob on the back of it the same as if you were preparing the finished plate. The metal is placed in a ladle and set in boiling water. It fuses at the point of boiling water, and you pour it right in there, and in a minute it hardens so that you can remove it. That will tell you exactly within a short time whether there is sufficient atmospheric pressure on the back of the plate, and it is very often quite important to determine this at once when you intend making a set of teeth. You get an accurate bite, and have a plate to work on that is rigid, not very thick, and offers good resistance.

Dr. Smith.—What do you grind your teeth to,—the paraffin or the fusible metal?

Dr. Grant.—Sometimes you can finish the pattern right down and use it as a base-plate.

Dr. Smith.—Do away with the model and continue with the case with the fusible metal plate?

Dr. Grant.—Sometimes; not always. It is very often easier in fitting teeth to bury the teeth in wax. The point is the advantage of getting a good-fitting plate at once.

Dr. Cook.—You can make it set while you wait.

Dr. Stoddard.—How long will such a plate last?

Dr. Grant.—Well, that depends. In some cases, where it is handled carefully, it may last very well. In other cases they might need a new one shortly after they paid for it.

Another place where I found this fusible metal quite convenient was in the setting of a crown, where it is desirable to have a sharp cast of the end of the root. I take the impression with modelling compound and pour the metal right into it, and have got a perfect cast that I can swage up on at once. It is easier than changing from a plaster cast to a die, and you have little difficulty in getting a good cast.

It may also be used in preparing a regulating plate where you want it to fit quickly. It is a great deal better sometimes to get up a die, where the teeth are crooked, for caps on the teeth. You can do that at once.

Dr. Stoddard.—What did you call it?

Dr. Grant.—Lennox fusible metal. You can get it at Ash's. One formula is five parts bismuth, three parts lead, two parts tin. It fuses at the point of boiling water. You can get it a little lower with antimony, but it is not necessary.

Dr. Parsons.—How many times can you use that metal?

Dr. Grant.—Oh, indefinitely.

Dr. Stoddard.—Do you always melt it in boiling water rather than over a direct flame?

Dr. Grant.—Yes, because the bismuth will burn out easily if you get it over the melting-point.

Dr. Stoddard.—How do you separate it from the model?

Dr. Grant.—It comes right off. The surface of the modelling composition will soften in the heat of the metal, and you can take it off in an instant.

Dr. Stoddard.—What did you say was the name of the modelling composition?

Dr. Grant.—King's compound. It takes a sharper impression of the model than anything I have seen. It is used in the same way as the ordinary red modelling composition.

The other thing that I have brought down I do not think, perhaps, many of you will care about; but in making a metallic plate it is quite desirable very often to have a thin cast, and you can get a thinner cast, and one that you can remove readily from sand. This modelling flask of Dr. Pearsall I find very convenient. It has a round, cone-shaped base for the die that insures striking in the centre. Every one who has done any swaging knows that the greatest difficulty is in getting the blow exactly in the centre,—it is very apt to strike one side or the other. I like this flask better than the Hayes. It admits of working very rapidly and yet produces such good results.

I have found all of those things very useful indeed in my practice, and I felt grateful to Dr. Pearsall for showing them to me. He told me that he felt very much gratified with what he saw on this side, but he felt that he would like the Yankees to see that they had good ideas over there.

Dr. Smith.—I will speak a few minutes on this modelling flask. When I took the chair of mechanical dentistry at the school, I went to work to brush up on mechanical dentistry, and of course came in touch with this Pearsall flask, and it seemed to me the best thing that there was in the market. It was simple, and yet it seemed, like many English appliances, a little clumsy, and I think that Dr. Grant will agree with me that it takes a large amount of

sand. I felt that there might be something better secured for the purposes for which it is used, so I studied on it myself, and also got the wizard of my office, Dr. Shaw, interested in the subject, and with his practical ability he developed a flask that I think is far ahead of anything in the market. I exhibited it to the class last year for the first time, and we are having the patterns made now from which a number can be produced for those who would like them. Had I known that Dr. Grant was to refer to this subject, I would have brought the flask here and shown it. I hardly think that I could describe it to you, but will bring it here at some future meeting.

Dr. Grant.—I can quite understand how Dr. Smith, or any one else, could have improved upon that flask in that way, but inasmuch as I received it in the way I did, I did not wish to make any criticism upon it. In fact, the only criticism that I should make would be that it is a little larger than it need be, and yet, under certain circumstances, I find a large body of sand quite desirable. Of course, the Hayes flask is much smaller, and I thought this one better than the Hayes. It served me very well.

He gave me some very good hints in the application of fusible metal. I found it of immense advantage in working where time is an object. They also use it for making splints. They make a splint for a fracture in about an hour, whereas if you have to vulcanize one, it will take the best part of a day. You can see that the great rapidity with which it can be worked is an immense advantage.

Dr. Smith.—Can Dr. Grant tell us if, in the use of fusible metal for fractured jaws, the metal is sufficiently strong for these arm-attachments that it is necessary to bring out around the jaws as a support?

Dr. Grant.—Yes. It is brittle and will not bend, and yet it is hard enough so that arms of wire are securely retained.

H. L. Upham, D.M.D.,
Editor Harvard Odontological Society.

Editorial.

DENTAL NOSTRUMS.

The insertion of secret preparations in the advertising pages of dental journals has lately met with much well-merited censure, as reflecting upon the ethical character of those who have permitted the reprehensible breach of those fundamental ethical principles which should be as binding upon the promoters of dental literature as they are upon the individual members of the profession. It may, indeed, be held as a more serious ethical breach by the management of a journal to admit the blatant advertisements of the nostrum vendors than it is on the part of an individual who may weakly permit himself to fall into the careless or indolent use of such preparations.

Those which have been held to be most seriously objectionable are the class designated as local anæsthetics under various proprietary names. These have received the most urgent criticism because of their dangerous nature, as the essential ingredient of each and all of them is a drug which, unless used with great caution and with full knowledge of the percentage of the toxic ingredient, may be followed by serious consequences to health and to life.

What renders these local anæsthetic nostrums most censurable is that they are pretentiously advertised as harmless, when, from their composition, they are far otherwise than safe to use.

Formulas of local anæsthetics, containing cocaine for various purposes in dental practice, with the required care concerning their employment and the necessary treatment to be taken in case of the appearance of toxic effects, have been repeatedly published. This consideration deprives every honorable person of any excuse for using any one of the advertised nostrums of this kind.

This brings forward another aspect of the subject which clearly places the vendors of secret preparations within the characterization of carrying on a fraudulent imposition upon their fellow-men. When it is considered that the proprietors of the above-stated nostrums are using the common knowledge of the profession, which they have derived from its literature, and palm it off at an amazing profit on the public, the ordinary language which should be applied to them becomes too weak to define the dishonesty of their conduct.

This general subject has been under serious and extended discussion before the American Medical Association, wherein the trustees of the journal of the Association defended their action in admitting doubtful advertisements as a source of profit; but as the result of the questionable light in which it placed the trustees, and as compromising the standing of the journal, they reversed their policy, and determined *to accept no advertisement of medical preparations the proprietors of which do not give a formula containing the official or chemic name and quantity of each composing ingredient, to be inserted as a part of the advertisement.*

It therefore becomes the bounden duty of each dental journal laying claim to honorable character to refuse to accept any advertisement which does not fulfil the requirement of the above rule of the journal of the American Medical Association, and the profession would rightly visit its censure upon the dental journals which disregard this righteous policy. L. J.

PENNSYLVANIA STATE DENTAL SOCIETY.

The meeting of the Pennsylvania State Dental Society, held at Glen Summit, Pa., July 6, 7, and 8, had a very large attendance, and in many respects was the most important gathering held in the State for some years.

The new dental law passed by the Legislature, and to which the governor has since appended his signature, made the selection of the Board of Examiners an important part of the work. This was accomplished without friction, and it is anticipated that the governor will make the appointments, at an early date, from the names selected by the Society.

The law, as adopted, is one of the best upon the statutes of the several States, and obviates some of the serious objections found in many of the crude productions elsewhere formulated.

The unfortunate difficulty that this Society met with at the session of 1896 was thoroughly examined into, and, it is believed, the conclusions of the committee, having it in charge, will amicably settle all the contentions that have disturbed dental professional circles for the past year. The conclusions of the committee will be found under the proper heading.

This meeting enforces previous conclusions of the writer, that State organizations are drifting more and more into legislative

bodies, and it is hopeless to expect extended scientific results in that direction. The present meeting was mainly occupied with this character of work. The few papers read were excellent, but they were principally relegated to the last session, which is neither complimentary to the writers or satisfactory to the audience. Unless some improvements are made in the direction of essays, the attendance at future meetings of the Society will be confined mainly to those interested in the legislative work of the organization. Such a result should be a matter of regret, for, with proper care in the arrangement of business, it might be avoided in the future.

THE COAGULATION THEORY.

The discussion upon this subject, which has taken a wide range and claimed the interest of many minds for years, seems to be drawing to a conclusion, if the very thorough experiments of Dr. E. L. York (*Dental Review*, July, 1897) are to be accepted. These investigations clearly prove that a coagulant, such as carbolic acid, does diffuse through dentine, notwithstanding assertions made to the contrary, and "does not form an impenetrable coagulum at the orificial ends of the dentinal tubuli." These investigations substantiate those previously made, and, conjoined with those presented in this issue by Dr. L. P. Bethel, form a series of facts that certainly settle the question.

It is a gratification, in this connection, to note that this work has been completed by two of the younger generation of dentists, demonstrating the value of the higher dental education adopted in all the dental colleges of the country. It is also satisfactory to observe that the younger men are not willing to accept age and experience as absolute authority, but seek for truth, where it alone can be found, in earnest and careful investigation.

Bibliography.

A Practical Treatise on Mechanical Dentistry. By Joseph Richardson, M.D., D.D.S., Late Professor . . . in the Indiana Dental College, etc., etc. Seventh edition, revised, enlarged, and edited by George W. Warren, D.D.S. With six hundred and ninety-one illustrations, many of which are from new and original drawings. P. Blakiston, Son & Co., Philadelphia, 1897.

The seventh edition of Richardson's Mechanical Dentistry expresses in a few words the demand for this text-book, which has for so long a period been recognized as an authority upon that important branch of dentistry. It has become the habit of a certain class of mind to cavil at the mechanical branch of dental work as something that a professional man should relegate to those who make of it a specialty. It is safe, however, to assume that the dentist who fails to familiarize himself with the technique of this part of his work is not a dentist in the best sense of the word, for mere theory never did or will make a man an acceptable practitioner. It is a satisfaction, therefore, to find that this standard work continues, in the hands of the present editor, fully abreast of all the improvements made, and this is evident in the elaboration of all the chapters; in fact, there is an entire revision of the work, making it, practically, not a new edition, but a new work.

For one man to do this, in the complex relations which mechanical dentistry has assumed in the last decade, means an ability of no ordinary character, and Dr. Warren should be congratulated that he has succeeded so well in overcoming all the difficulties insuperably connected with a work of this kind.

The tendency of the present period is to make text-books through collaboration of many minds. This is a recognition of the division of prosthetic dentistry into several specialties. This has its good and its bad expression. Good, in that it is likely to give a greater variety of thought, as well as a direct system of individual practice; and bad, as it tends to giving the book an encyclopædic character, thus losing that coherence of thought so important in text-books. On the other hand, the individual production means a loss of system, for it is next to impossible for one person to gather

all the ideas of individuals into a condensed form and give the original thoughts full justice. The result is apt to be confusing to the beginner, however valuable it may be, as a means of reference, to the experienced operator. This difficulty is nowhere more apparent than in the multiplication of methods and so-called systems of crown- and bridge-work. If these were all reduced to compact and orderly arrangement, it would lessen the bulk of the volume and add much to it as a valuable aid in teaching.

The editor has made notable improvements in many of the chapters, especially in the important matter of soldering, one of the most difficult operations the student is forced to meet and conquer.

In a book of this kind criticism, as to many minor defects, would be out of place. The general make-up and careful discrimination in the selection of methods is worthy of highest praise. In future editions it would add greatly to the value of the book if detailed descriptions were employed. In illustration of this need reference may be made to the preparation of lower plates. There is probably no more difficult piece of work for the beginner than this, and all the steps in the process should be detailed, especially in the matter of soldering two plates together.

The critical examination of this book carries with it a feeling of satisfaction that the year 1897 has given to dentistry two text-books on mechanical work, each worthy of high commendation, and evidencing a growing tendency to cherish the practical side of our calling as worthy to extend upon parallel lines with that regarded as more strictly professional. It is, therefore, gratifying to feel that Richardson's Mechanical Dentistry will retain its place as a text-book, at all times valuable and indispensable for reference for both practitioners and students.

Some Methods and Appliances in Operative and Mechanical Dentistry. By R. P. Lennox. With illustrations. Claudius Ash & Sons, Limited, London, 1897.

In this little book of one hundred and twenty pages, it is safe to assert, will be found more original and suggestive paragraphs than will be discovered, in similar space, in more pretentious volumes devoted to mechanical dentistry. The author, R. P. Lennox, is well known in dental circles in England for his many original ideas. These he has compiled in book form, and will present a novel character to those familiar with processes upon this side of the water, and must impress the mind with their simplicity and apparent effectiveness.

The author says in his preface, "An attempt has been made to reply once for all to questions put to the author from time to time with regard to papers he has read before the British Dental Association and its branches. . . . Advantage has also been taken of the opportunity afforded by the carrying out of these purposes to add a few hints on matters not found in the text-books, and, further, to give an account of those of the author's methods of working which differ from the methods generally to be found there."

In accordance with the custom in Europe, much space is given to the use of springs, long since relegated to the unknown in this country. This latter fact is, perhaps, to be regretted, for cases occur in practice where these could be used to advantage; and this is practically the author's position, for he says, "In the majority of cases well-made plates need no special contrivance to keep them in position." His suggestions upon taking the "bite" and flasking are excellent, and might generally be adopted with advantage.

The use of Ash & Son's teeth bring into prominence some methods certainly novel to the average American dentist. His illustration of a cutting instrument to *shorten teeth*, where required, is a process, it is imagined, not even thought of here, much less attempted with the ordinary porcelain teeth in use..

The chapter on fusible metal is replete with valuable suggestions and well worthy of quoting entire, but without the profusely illustrated pages would not be clearly understood. The same may be said of the chapter on matrices.

It is not necessary that this original production should be followed in this review from preface to appendix. Every page indicates the mechanic and thinker, and one capable of describing his methods and with the courage to follow them out, whether in agreement with established usage or otherwise. American operators might do well to study the methods herein detailed, for while they will naturally not agree with some of them, they cannot fail to secure ideas of value and of great assistance in facilitating operations.

Obituary.

DR. WILLIAM HENRY SMITH.

Dr. William Henry Smith died at Newport, R. I., June 23, 1897, of senile asthenia and valvular insufficiency, in the eightieth year of his age.

Dr. Smith was born in Pawtuxet, R. I., December 1, 1817. He studied dentistry under a preceptor in Norwich, Conn., and began practice in Newport, R. I., nearly fifty years ago, continuing in the work there up to the time of his last sickness. He was one of the oldest practising dentists in the State, and his working-hours during his most active period were decidedly the larger part of the twenty-four, but the time was spent to the satisfaction of his patients. He displayed some mechanical ingenuity by inventions outside of his profession.

A married daughter, two grandchildren, and three great-grandchildren survive him.

Domestic Correspondence.

REPLY OF DR. C. N. PEIRCE.

To the Editor:

Sir,—The resolution sent to you, and published on page 482 in July issue of International Dental Journal, purporting to be a copy of the resolution adopted by the Odontological Society of Pennsylvania, on May 8, was not written until three days after the final adjournment of the Society, on Tuesday, May 11, 1897. The secretary of the Society was invited into the office of the gentleman claiming to have originated and presented the resolution, and there and then for the first time was that resolution dictated to the secretary. The resolution published in the previous issue of the Journal is the one offered by myself and adopted by the Society.

Your's truly,

C. N. Peirce.

Current News.

REPORT OF THE COMMITTEE ON IRREGULARITY AT THE PENNSYLVANIA STATE DENTAL SOCIETY, GLEN SUMMIT, PA., JULY 6, 1897.

To the Pennsylvania State Dental Society:

Gentlemen,—Your committee to whom was referred the question of irregularity committed at the session of this body, July, 1896, in the election of candidates for the Board of Examiners, would beg leave to report.

That it has given the subject careful consideration through several lengthy sessions, and has quite thoroughly examined all parties in interest, said examinations having been correctly reported stenographically and preserved as evidence of faithful work.

The testimony generally exhibited agreement upon the main facts, and where any discrepancy existed it seemed to be upon possible misconception of meanings.

It is the unanimous conclusion of the committee that the president at that meeting did make an informal expression of opinion regarding the disposition of surplus names upon the ballots, but they have reason to conclude, from the evidence, that this was given in the confusion incident to a general meeting and without any conception that it would be applied to the election of the Board of Examiners. On the other hand, it appears equally clear that two of the tellers, Drs. Roberts and Deane, construed this to apply universally throughout the balloting. Your committee are therefore unanimously of the opinion that the unfortunate occurrence was the result of a misunderstanding, combined with a lack of knowledge on the part of Dr. Deane, of the usage governing the reading of ballots, and they further failed to find that there was any evidence of fraud contemplated or attempted. They are further satisfied also that there was no evidence to influence a belief in a supposed conspiracy to defeat a candidate.

In view of these general statements, and in accordance with its duty, the committee would append the following resolutions for the consideration and adoption of the Pennsylvania State Dental Society:

Resolved, That after careful examination of the entire subject of irregularity said to have been committed, as heretofore stated, there has not been found the slightest evidence upon which to found a criminal charge.

Resolved, That this society extend to Dr. Deane the regrets of the entire body that he should have been subjected to unfounded and unwarranted suspicions during the past twelve months, but, while expressing this, it is important that it should be clearly understood that this difficulty might have been avoided by a better comprehension of the duties intrusted to the office of teller.

Resolved, That the committee, having performed all the duties required of it, is therefore discharged from further consideration of the subject.

(Signed)
LOUIS JACK.
HENRY GERHART.
EDWIN T. DARBY.
G. W. KLUMP.
JAMES TRUMAN, *Chairman.*

The following preamble and resolution were offered by Dr. Truman, chairman of the committee, and ordered by the Society to be made part of the original report.

WHEREAS, The names of Drs. Robert Huey and H. H. Burchard, joint tellers with Dr. Deane in the counting of the ballots, having been brought unpleasantly into this matter, it may be inferred by those not conversant with all the facts, that these two were implicated in the charge of irregularity, therefore be it

Resolved, That neither in this Society nor in the dental profession throughout the State of Pennsylvania has there, at any time, been the slightest suspicion concerning their integrity or that they were cognizant of the irregularity, and this Society, without any reservations, relieves them of all responsibility in the matter.

A VOLUNTARY STATEMENT BY DR. JOSEPH HEAD, WHICH WAS ACCEPTED BY THE PENNSYLVANIA STATE DENTAL SOCIETY, JULY, 1897.

INASMUCH as I sincerely regret that the issuing of the pamphlet reporting the action of the Odontological Society should have caused unjust suspicion to fall upon any one, and inasmuch as reprints of such action, which I, in accordance with my duty as editor, furnished to a member upon request, have been mailed, without the knowledge of the Odontological Society, to many of our profession, causing, by their incomplete evidence, grave injustice to three respected gentlemen, it will be my pleasure and duty when

I return to Philadelphia to see that a complete retraction is made and forwarded to each person who received a copy of the aforesaid pamphlet; and, furthermore, in the August number of the *Dental Cosmos* and the International Dental Journal, I will see that this statement is inserted.

(Signed) Joseph Head,
Editor of the Odontological Society.

THE HARVARD DENTAL ALUMNI ASSOCIATION.

The Harvard Dental Alumni Association observed Monday, June 28, 1897, as "Alumni Day."

At the Harvard Dental School building, in the morning, the work of the freshman, junior, and senior classes for the past year was shown, and clinics and demonstrations given.

A large number of patients with fractured jaws were present, showing the conditions arising in the oral cavity and by plaster casts with appliances *in situ.* Likewise were shown patients with cleft palate and orthodontia conditions.

One hundred and fifty-two visitors (aside from patients) were registered and shown throughout the building, being met at the entrance by members of the reception committee.

In the surgical department was successfully performed, by Professor Thomas Fillebrown, an operation in staphylorrhaphy upon a child six years of age.

Dr. Dwight M. Clapp exhibited the X-ray apparatus, and showed, by means of a patient in the chair, its utility and practical value in dentistry.

Three entertainments for the afternoon were provided, viz.,—a barge ride through historic Cambridge and inspection of University buildings; twenty persons took this trip; nine members took the bicycle run through the park system, and thirteen enjoyed themselves at the theatre.

Five o'clock, P.M., found eighty-eight persons gathered at Young's Hotel, Boston, who participated at the twenty-sixth annual banquet of the Association.

Reports of officers were submitted, showing the Association to be in a flourishing condition. Rev. George Hodges, A.M., D.D., of Cambridge, Mass., the guest and orator of the evening, spoke upon the topic "Since the First of January," covering the events

of the past six months. The growth and success of the school was described by Professor E. H. Smith, Dean of the Dental School, who said, among other things, that in eight years the school had secured forty-eight thousand dollars, that for the past year there were one hundred and thirty-two pupils in the various departments of the school, and that the incoming freshman class numbered at least thirty men. The graduating class numbered thirty-two, the largest number ever receiving the degree in a single year.

Charles W. Berry, '97, responded in a humorous vein for the class.

During the progress of the dinner the election of officers took place, and resulted as follows: President, Joseph T. Paul, '91, Boston; Vice-President, Frederick Bradley, '86, Newport, R. I.; Secretary, Waldo E. Boardman, '86, Boston; Treasurer, Harry S. Parsons, '92, Boston.

Executive Committee.—Waldo E. Boardman, '86, Boston; William P. Cooke, '81, Boston; Frank T. Taylor, '90, Boston.

The council is composed of the officers of the Association.

WALDO E. BOARDMAN,
Secretary.

BOSTON, July 7, 1897.

WOMAN'S DENTAL ASSOCIATION OF THE UNITED STATES.

THE fifth annual meeting of the Woman's Dental Association of the United States was held at the office of Dr. Mary H. Stillwell, 1718 Walnut Street, Philadelphia, March 6, 1897.

The following officers were elected for the ensuing year: President, Dr. E. Davis; Vice-President, Dr. M. B. Rauch; Recording Secretary, Dr. Frances G. Crouch; Corresponding Secretary, Dr. A. S. Focht; Treasurer, Dr. C. M. Wyeth.

Executive Committee.—Drs. Mary H. Stillwell, Martha A. Corkill, Maria S. Lasser, Hannah Miller, and Eliza T. Yerkes.

The Vice-Presidents from representative States are Drs. Sara May Townsend, of Colorado; Edith Jewell, of Washington, D. C.; Hester Baker, of Illinois; Mary Gallop, of Massachusetts; Fannie C. Hoops, of Maryland; May Weston, of Missouri; Alice Ireland, of New York; Cora S. Little, of Nebraska; Sarah Gardiner, of Wyoming, and Jennie H. Gallop, of Rhode Island.

The membership numbers thirty-four

The June clinic was held at Dr. Davis's office on Walnut Street. Demonstration with soft gold by Dr. Davis.

Meeting adjourned to meet in the early fall.

FRANCES G. CROUCH,
Recording Secretary.

302 SOUTH TENTH STREET, PHILADELPHIA.

RECENT PATENTS.

A LIST of recent dental patents reported for the INTERNATIONAL DENTAL JOURNAL:

No. 581,986.—Dental chair. Aaron P. Gould, Canton, Ohio. Filed September 16, 1896.

No. 582,045.—Dental plate. William S. Depew, Jamestown, New York. Filed December 30, 1896. Assigned to Milo Harris, same place.

No. 582,213.—Dental matrix. Edward B. Lodge, Cleveland, Ohio. Filed December 24, 1896.

No. 582,342.—Method of treating artificial dentures. Edward L. Chaffin, Helena, Ark. Filed August 31, 1896.

No. 582,731.—Dental articulators. Frank Fourt, Fairfield, Iowa. Filed February 5, 1896.

No. 582,796—Dental mandrel. Charles J. Peterson, Dubuque, Iowa. Filed June 25, 1896.

No. 583,307.—Dental rubber. Isaac B. Kleinert, New York, N. Y. Filed February 28, 1897.

No. 583,472.—Dental disk mandrel. Henry Heath, Jr., Brooklyn, N. Y. Filed June 10, 1896.

No. 583,565.—Dental bridge-work. Cassius M. Carr, Los Angeles, Cal. Filed April 19, 1895.

No. 583,625.—Dental hand-piece. Comegys C. Lusby and John Lusby, Philadelphia, Pa. Filed September 25, 1895.

No. 583,735.—Dental polishing disk. Carroll W. Dodge, Worcester, Mass. Filed December 6, 1895.

No. 583,848.—Dental impression cup. Robert A. Dunlap, Carrollton, Ohio. Filed April 1, 1897.

No. 584,345.—Artificial denture. Abraham L. Gilmer and Benjamin F. Gilmer, Quincy, Ill. Filed August 10, 1896.

No. 584,696.—Device for preventing stammering. Newton

Monday, Plattsburg, Mo., assignor of one-half to John F. Deberry, same place. Filed October 1, 1896.

No. 585,305.—Tooth-crown holder. James K. Burgess, Baltimore, Md. Filed October 30, 1896.

No. 585,358.—Tooth-brush. Frank D. Gould, Port Richmond, N. Y. Filed October 29, 1896.

No. 585,494.—Dental engine mallet. Clyde E. Williams, Springfield, Mo. Filed June 30, 1896.

Trade-Mark.—No. 29,987.—Tooth-brushes and other brushes. Charles Loonen, Paris, France. Filed April 10, 1897. The word "Comilo."

POSTPONEMENT OF MEETING.

The Executive Committee of the American Dental Society of Europe has decided to postpone the meeting arranged for this year in London until August, 1898.

The next meeting will celebrate the Twenty-fifth Anniversary of the founding of this Society, and it is hoped that all members will participate in making it a brilliant success.

By order of the Executive Committee.

L. A. O'Brian,
Secretary.

15 Walpurgisstrasse, Dresden.

NORTHERN OHIO DENTAL SOCIETY.

At the annual meeting, held at Put-in-Bay, June, 1897, the following officers were elected for the ensuing year:

President, L. P. Bethel, Kent; Vice-President, L. L. Barber, Toledo; Corresponding Secretary, W. T. Jackman, Cleveland; Recording Secretary, F. W. Knowlton, Akron; Treasurer, W. H. Fowler, Painesville.

F. W. Knowlton,
Secretary.

Selections.

A DANGEROUS POPULAR ANTISEPTIC.

Ledermann publishes in the *New York Medical Journal* for May 18 an account of a case of diffuse external otitis, of an extremely severe and resistant type, due to taking a friend's advice and treating a slight itching of the ears with carbolic acid. The strength employed is not known: "some pure carbolic acid was poured into a glass of water and syringed into the ears." Ocular symptoms and carboluria showed the systemic poisoning, and the patient was in great danger of atresia of one of her auditory canals.

The popular knowledge that carbolic acid is an antiseptic is productive of a great deal of harm. Surgeons have until recently regarded it as indispensable to have their instruments in a tray of carbolic solution, which, if strong enough to sterilize the instruments, destroyed the surgeon's hands for practical purposes; and if, as was usually the case, it was so weak as not to actually burn the hands, did no good as an antiseptic,—circumstances which were bad for the patient, the surgeon, and all concerned. The disadvantages of carbolic acid, however, can be best seen in out-patient clinics, whither patients continually come with the skin of their hands parboiled and peeling off, exposing the raw subcutaneous tissue more or less eroded by the carbolic acid which a kind friend had advised him to use for a slight cut, or burn, or abrasion. If the lay mind could only be made to appreciate that carbolic acid is always dangerous and seldom efficient as an antiseptic, a great deal of unnecessary suffering would be prevented.—*Boston Medical and Surgical Journal.*

LYSOL TO REPLACE CARBOLIC ACID.

"In the early years of the employment of carbolic solution, the daily papers kept a permanent heading for cases of carbolic acid poisoning. It cannot be denied that the introduction of lysol solutions has resulted in a marked improvement."

This editorial utterance of the *Boston Medical and Surgical Journal* tersely confirms the well-substantiated fact that lysol is an effective substitute for phenol or carbolic acid, and at the same

time is practically harmless. It takes eight parts of lysol to equal one part of carbolic acid in toxic effect, and whereas a dose of carbolic acid, taken intentionally or by accident, is usually fatal, with frightful effect and suffering, a toxic dose of lysol would not cause the same awful symptoms, and also affords much better, almost sure, chances of recovery under proper treatment. There is on record a case of a four-year-old boy drinking one ounce of lysol; four hours later the first steps at treatment were taken, the boy's stomach was washed repeatedly, and liberal doses of milk then administered; the next morning the boy had fully recovered.

The suggestion from this brief statement of facts is patent carbolic acid is a dangerous agent, and the danger is aggravated by the universal use to which it is put and the consequent familiarity of the public with it; having a perfect substitute in lysol five times more effective and one-eighth as toxic as carbolic acid, it is the manifest duty of physicians and pharmacists to give lysol the preference, and to prescribe and recommend it wherever available.—*Notes on New Remedies.*

ORIGIN OF GIANT CELLS.

Anton Brosch (*Virchow's Archives*, 1896) concludes as follows:

1. Giant cells may not only originate from degenerated angioblasts, endothelia, white blood-corpuscles, etc., but also, in certain instances, from newly formed vessels of large calibre, as a result of a peculiar (perhaps tuberculous) affection of the vessel wall and a coexistent, still unknown, regressive metamorphosis. The existence of large giant cells with double nuclear wreath may be taken as proof of the accuracy of this assumption.

2. It is also possible that obliteration of the vessel lumen by proliferation of diseased intima cells (endothelial cells), and the formation of ectases by such obliteration, or by compression and distortion from without (by cellular infiltration and nodule formation in the immediate neighborhood), may play an important *rôle* in favoring the generation of giant cells from newly formed vessels of large calibre.

3. Since connective tissue occurs everywhere in the organism, and, as Bizzozero and Bozzolo have shown, can assume an endothelioid character, it is not improbable that all giant cells are derivatives of endothelium, or of endothelioid connective-tissue cells.—*Journal of Cutaneous and Genito-Urinary Diseases.*

THE

International Dental Journal.

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Original Communications.[1]

CATAPHORESIS.[2]

BY LOUIS JACK, D.D.S.

Gentlemen,—The subject selected for your instruction this evening is the new and most interesting method of introducing medicaments into the tissues. In its application in certain directions it is proving of great importance to dentistry.

Before entering into the direct relations of the subject, it will be of interest, and throw light upon the application of this mode of treatment, if some consideration of the general principles and laws governing the peculiar force called electricity be stated. To make use of electricity for any practical purpose necessitates a definite knowledge of these principles.

The exact nature of electricity, as you are aware, has not been determined. It can only at present be defined as a kind of cosmic force; but certain properties and modes of action have been clearly determined, and have been reduced to mathematical precision. From these, definite laws have been clearly established.

The minds of most persons have been confused by the term fluid as applied to electricity, and, in connection with the word

[1] The editor and publishers are not responsible for the views of authors of papers published in this department, nor for any claim to novelty, or otherwise, that may be made by them. No papers will be received for this department that have appeared in any other journal published in the country.

[2] Lecture delivered before the E. T. Darby and James Truman Societies,—students of the University of Pennsylvania.

current, as expressive, by analogy, of the movement of fluids. As electricity is capable of being converted into light, heat, and magnetism, and through magnetism into mechanical force, it follows, hence, that electricity is neither matter nor a condition of matter, but is a form of force. This is further established by the principle that either of those other mentioned forces may be converted into electricity or be made the means of exciting electrical action.

As the ether is assumed to be a subtile substance, filling the immensity of space and permeating all forms of matter, in like manner electricity is considered to be an all-pervading force, equalizing the movements of and controlling all molecular action. The presence of electricity is elicited by every chemical activity and every mechanical action; each whispering breath of air excites it; the molecules of water, as they are raised by the sun's heat, bear with them their modicum of this force until the potentiality of the storm-cloud manifests the tremendous force so accumulated by the lightning's flash and the thunder of the heavens.

Its movements are constantly in the direction from bodies of high to those of low potentiality. This action, since the presence of the force is everywhere, is incessant, but is ordinarily unnoticed, except where potentials are excited by chemical or mechanical means.

Electricity has two elemental properties. These are defined as current strength, which is designated by the term ampèrage, and electro-motive force, which is termed its voltage.

The active energy of electricity depends upon the first property,—its ampèrage, its distribution upon the latter. Since it must be assumed that few bodies are perfect conductors, this force or pressure is of that degree which is required in any given case to move the active element, the ampèrage, against the resistance it meets with.

For illustration: the voltage has its analogue in the height of a column of water, the ampèrage being represented by an opening at the bottom of the column; according to the height of the column constantly maintained will be the force represented by the escaping stream at the bottom. The resistance would here be represented by the length of pipe which may be applied to the aperture,—in other words, by the extent of the friction.

In *perfectly conducting* substances electricity moves with absolute freedom, under any electro-motive force, however small.

In *perfectly non-conducting* substances electricity will not move under any electro-motive force, however great.

In *imperfectly conducting* substances electricity moves only under

the exhibition of intense electro-motive force. The required force varies as the substance is a more or less indifferent conductor.

An ampère of current is so much as will deposit .00118 gramme of silver per second when passing through a standard solution of nitrate of silver, or which will decompose .09326 milligramme of water in one second.

Hence, the ampère is the active cause of electrical power, and depends upon the voltage for its efficiency.

A *volt* is the electro-motive force required to impel one ampère of current through one ohm of resistance.

An *ohm* is the amount of resistance which will permit one ampère of current at one volt to pass in one second.

In the economic application of electricity, its transmission is effected through metal connections, the resistance of which is governed by the character of the metal, the cross-section, and the distance. For certain purposes other substances, such as water, carbon, or graphite, are employed to effect great resistances.

The *ampèrage* flowing in a circuit is equal to the E. M. F. divided by the resistance.

The *resistance* equals the E. M. F. divided by the ampères.

The *volts* equal the ampères multiplied by the ohms.

The *watts* equal the volts multiplied by the ampères. The watt is the unit of efficiency, or of work. (Seven hundred and forty-six make one horse-power.)

The formula is expressed thus: $V \div R = A$; $V \div A = R$; $A \times R = V$; $V \times A = W$.

It follows, from the formula, that the amount of power and the cost of producing it are the same, whether the current is of large ampèrage at low voltage, or of small ampèrage at high voltage. Thus, an incandescent lamp may be supplied by one hundred volts at one-half ampère, or by fifty volts at one ampère, the result in each case being fifty watts.

Comparative Illustration.—It is the same as with water in a column; the same degree of force is secured when the column is heightened and the aperture correspondingly reduced.

To illustrate the application of the formula in practice:

If we have a current of one hundred volts at fifteen ampères, and wish to use only two and a half ampères, the resistance put in the circuit is found thus: $100\ V \div 2\frac{1}{2}\ A = 40$ ohms.

In case we have seventeen and a half volts at ten ampères, and wish to charge a storage-battery at two and a half ampères, the resistance is determined as before, thus: $17\frac{1}{2} \div 2\frac{1}{2} = 7$ ohms.

Now, if we have two and a half ampères under seven ohms resistance, you see it requires seventeen and a half volts to move this degree of ampèrage against the given resistance, thus: $2\frac{1}{2}\ A \times 7\ R = 17\frac{1}{2}\ V$.

If one has a current of one hundred and ten volts, and wishes to employ a motor of one-quarter horse-power, what is the least ampèrage required? Answer: $1\frac{69}{100}$; which is found by dividing 186 watts by 110 —.

With the formula any one may, from one known quantity and a desired quantity, determine with ease the third factor.

These elementary examples are shown you to make it plain that the means of determining the character of the current for any given purpose is very simple.

These examples make it appear that the elements of electricity are more easily calculated than are those of heat. We are lighted by the sun's rays, and are heated by derivatives from the sun, and are familiar with the employment of heat and light; but, as electricity cannot so easily be borrowed at will, it has been treated as incomprehensible by the ordinary person, but you see its elements are of simple computation.

Electrical force of different quality may be produced with galvanic batteries by arranging them in series or multiple. If in series, the voltage is the sum of the volts of the cells so arranged; the ampèrage is that of one of the cells. This arrangement produces a current of high tension.

If joined in multiple,—that is, positive to positive and negative to negative,—the volume in ampères is the sum of the ampères of all the cells, while the voltage is that of one of the cells. This method produces a low tension current.

When arranged in series, if each cell has a voltage of two and an ampèrage of one, the current with five cells will have an electromotive force,—*i.e.*, voltage of ten, and a strength of one ampère. This method is called that of intensity, as just stated. The same number of cells joined in multiple would yield a current of five ampères or two volts, and hence would be of low tension, but of high quantity.

In cataphoresis, as applied in dentistry, where batteries are the source of the current, the arrangement should be in series, since, as will later appear, the teeth are tolerant of the movement into them of only a small degree of ampèrage. The ampèrage must necessarily be of low ratio to the voltage.

We now approach the practical features of the application of

electricity to the treatment of tissue by conveying thereby drugs into their substance.

Electricity in connection with medicaments has in dentistry several directions in which it may be employed,—viz., for the treatment of acute dentinal sensitivity, for anæsthetizing and removal of the dental pulp, for relieving deep inflammatory conditions of the tissues adjacent to the teeth, for bleaching discolored teeth, and for disinfecting root-canals.

Your attention will be principally directed to the treatment of dental sensibility.

The term "voltaic narcotism" was the first term applied to the phenomena observed; then, cataphoresis; later, the term electrical osmosis, and other terms, as, anaphoresis, electro-medicamental diffusion.

The term electrical osmosis in most respects better defines the action which takes place than the word cataphoresis.

You are already familiar with the phenomena of endosmosis. Briefly stated, it is that when two fluids of unequal density are placed near each other with a permeable division between them, such as a membrane, the two substances become mixed through the partition. If a solution of a salt is on one side and water on the other side, the water at first passes towards the solution and raises its volume, but at length the two become equalized of strength.

If we arrange a vessel containing a saline mixture on one side and water on the other, and apply the anode on the side of the salt and the cathode on the side of the water, the osmotic process is prevented. If, on the other hand, the anode is placed on the side of the water and the cathode in the salt, the osmotic action is greatly accelerated, and what otherwise would require hours to naturally effect is done immediately.

This shows that electricity has the power to overcome or accelerate the natural law of osmosis.

But to make the matter clearer to you and to still better explain the phenomenon of the conveyance of a drug into the tissues: If a substance containing water, as a cooked egg, a ball of wet clay, or a piece of muscular tissue, has an anode connected with a current of high potential attached to one side, and the cathode is attached to the other side, the watery contents of the substance is conveyed forward and appears in excess at the side on which the cathode is placed; at the same time the anodal surface becomes dried, also, if a capillary tube of glass is filled with water having an anode applied in one end and a cathode at the other end the water will flow against

gravity. As a membrane or a tissue may be considered to be a series of tubes in close contiguity, it is at once apparent to you that the movement of fluids must take place through them in the direction the current is passing.

These experiments demonstrate the action which takes place when an aqueous solution of cocaine, for instance, is placed in a carious cavity. As the anode is put in contact with the saturated cotton the fluids of the tooth advance towards the pulp, through the canaliculi, their place being taken by the solution of cocaine. At the same time it is observed the saturation of the pledget of lint becomes less wet and requires an occasional addition of the solution to the lint. Some loss of the water in the solution is to be accounted for by the evolution of heat in the parts immediately concerned, because of their resistance to the current.

We have then two coincident phenomena to keep in view: the movement of the fluids of the dentine along the course of the current, and the well-observed law of the movement of any fluids in the range of the current from positive to negative.

You thus have presented to you another law of electricity, which has not been sufficiently emphasized as a basis for a correct hypothesis to account for the transmission of an anæsthetizing agent.

As we have entered the practical field of the subject, I will take up the matter in the sequence that appears in its clinical aspects.

As to the character of cases where electrical osmosis is required, it is only necessary to state that it is applicable to those of acute condition,—that is, in a state of hyperæsthesia. It would be questionable to go through the required procedures where an ordinary escharotic would suffice, or where the application of heated air would render the case easily treated ; but in hypersensitive cases electrical osmosis is the most benign benefit which has been conferred upon dentistry in the century, equalling in its field with us the glorious and humane results which attend the use of general anæsthesia in major surgery.

When a case presents requiring this treatment, the tooth should be isolated by means of rubber dam. Should the position be on a proximate surface, the neighboring tooth should be included, unless the adjacent surface contains a metallic filling.

To illustrate the importance of this, let me state that a few days since I unwittingly passed the rubber dam over two teeth where one had a gold filling, recently put in. The gold filling was varnished. The cocaine applied and current turned on from ten cells

at an indicated ampèrage of three-twentieths milli, for thirteen minutes, with no result. There was evident leakage through the gold filling from imperfect insulation. A new dam was applied, enclosing only the carious tooth. The current again being applied for ten minutes, there was complete relief of the sensitivity.

In applying the dam the tooth should be ligated with a well-waxed thread, and any other means which may suggest themselves be used in difficult cases to prevent the encroachment of moisture.

The anæsthetizing agent may be either cocaine hydrochlorate or cocaine citrate, of a strength of from twelve to twenty-four per cent. in distilled water. The first named should be made fresh each day or time. The most convenient method is to have the cocaine prepared in powders of one and one-fifth grains. If to this quantity be added five minims of water, the result will be twenty-four per cent., and with ten minims, twelve per cent.,—the druggist's minim graduated glass being a most convenient vessel in which to make the combination.

The applicator, which forms the positive pole and is otherwise called the anodal electrode, should have a point of iridiumized platinum, for the reason that platinum is not oxidizable, and is not acted upon by hydrochloric acid. The iridium confers the necessary stiffness. The size of the point should be as broad as permissible to easily enter the cavity and to cover as much of the lint containing the cocaine as may be convenient.

An excellent form of anode is to curl a piece of fine platinum wire into a flat knot, or to form it in a double loop. On the loop sufficient lint to fill the cavity is wrapped, when it may be forced into those on the occlusal and proximate surfaces. These simple applicators are connected with the usual cords by a spring clip furnished by Louis Costa & Co., of this city. The latter method is used to enable the cord conveying the current to be sustained in order to avoid holding the applicator with the hand. This is for the sake of avoiding fatigue, and also, more important than this, to secure perfect stillness of the anodal connection, since, if any movement takes place, some shock is liable to be sustained.

Various forms of the anodal end of the applicator will suggest themselves to any one.

The cathodal electrode (negative) should be placed at some indifferent place, regard being had to lessen the resistance as much as may be possible. The resistance on the cathodal surface is of the skin and adipose tissue. If the person be comparatively lean,

the cheek before the ears is an excellent position; if fat, the palm of the hand offers probably less resistance, as being less fat.

Size.—If placed on the cheek, it should be not less than one and one-half inches in diameter; if in the hand, the ordinary hand cathode is used, covered with a napkin. In each case the spunk or the napkin should be wet with a solution of sodium chloride.

We now reach the question of the greatest importance,—the character, the voltage, and the ampèrage of the current.

It is with reference to clear views on this point that I felt it necessary to outline the general principles concerning electricity. It is easy to cause pain in the exhibition of the current if care be not taken, and it is not difficult to conduct the treatment without distress, and to produce results eminently satisfactory in nearly every case.

The first requisite is that the current be direct and constant. If sudden fluctuations, however small, occur, either of the voltage or of the ampèrage, immediate shock is felt in proportion to the range of the variation.

The source of current frequently used has been the one-hundred-and-ten-volt direct Edison current. This current, as will later appear, is of unnecessarily high voltage; is subject to some changes of voltage and to constant variations of ampèrage, as load is taken off or put on the general circuit. The variations of voltage are small, because the effort at the central stations is to maintain the electro-motive force at an even rate. This is necessary, as outlined in the beginning, because the efficiency of the system depends upon the maintenance of the pressure. But the ampèrage is never constant, and, as shown you in the premises, it is this property which is the prime element of electrical force. It is more important to avoid fluctuations of ampèrage than changes of voltage.

There are other objections to the one-hundred-and-ten-volt current, connected with possible grounding through water-pipes, through possible crossing of wires, etc.

Besides, you will probably agree with the conclusions, which we will come to presently, that the one-hundred-and-ten-volt current is employing a club to do what a wand will more efficiently effect.

The opinion is more and more becoming a fixed one that the current supplied by the public electrical companies is unreliable and unsafe.

For electrical osmosis the better source is from some form of galvanic cell arranged in series,—that is, positive with negative.

The amount of voltage required is from five to twenty. Less than five appears to be insufficient, and more than twenty are rarely needed. The ampèrage required for the series is not over one-half ampère, which will appear later when it is shown how infinitesimal a rate of ampèrage is sufficient and is tolerable.

The degree of electrical energy tolerated by living dentine is exceedingly small, on account of the peculiar and intense pain excited by the transmission of slight electrical currents through the teeth. This is shown by the low initial voltage required and the small degree of ampèrage used in cataphoric apparatus. Even these are generally greatly in excess, and have to be reduced by methods of effecting resistance.

The effect of resistance is to diminish the degree of ampèrage to a much greater extent than the voltage. I have made the endeavor to show that it is the ampèrage which produces the effect, and shall endeavor to make clear that it is the ampèrage which excites in the tissue the sense of pain induced by the evolution of heat. A comparative high rate of voltage will be tolerated when the degree of ampèrage is extremely small. Tesla has stated that he has produced in the vacuum-tube a voltage of one million volts, which he has passed through his body without injury. This current necessarily had an infinitesimal ampèrage, which rendered such an experiment possible.

In electrical osmosis as applied to the teeth the resistance necessarily must be extremely great to prevent what is called the impulse of the current, and also to diminish the ampèrage to a tolerable degree, as well as to restrict the voltage,—in other words, to diminish the energy of the current to sufficient weakness to meet the requirements of the most impressible cases which occur.

All forms of resisters are constructed on the principle of the selection of materials which are very imperfect conductors of electricity. The available substances for this appendage to a cataphoric apparatus are water, carbon, graphite, and coils of wire of known high resistance, the metal offering these requirements being German silver. In the case of the latter the degree of resistance is regulated by the length and fineness of the wire. In comparison with silver, the best conductor, German silver has a resistance nearly fourteen times as great (13.92).

The water rheostat may be passed as inconvenient, because the column required must be extremely high. German silver coils may also be refused as adjuncts, except when it may be necessary to reduce the ampèrage and voltage of high currents before connect-

ing them with any special cataphoric apparatus. It may, however, be used in connection with a *shunt*, as described by Dr. Price in the February number of the *Dental Cosmos*, to which you are referred.

The carbon and graphite resisters are usually connected in the form of a ring, with a switch passing over the circular path, or by arranging a series of points in close proximity, each point being in contact with the ring of graphite. In these forms they are called controllers. This is probably the most available form of resistance for our purposes. The latter form is the one I have been using, as invented by Willms; this has a rheostat of one hundred and twelve points, with which the switch engages as it passes over the circle. The one in the instrument before you has a resistance of four hundred thousand ohms, which is greater than is actually required. A German silver resistance of four hundred thousand ohms capacity would fill a very large portion of this room. For our purposes the initial ampèrage need not be over one-quarter of an ampère, which the present controller is sufficient to reduce without any apparent heat being excited in the instrument. This method of construction here shown you gives a fine gradation of resistance.

An indispensable instrument is the milammeter, which should have a scale indicating degrees of ampèrage as low as one-twentieth of a milliampère (a milliampère is one thousandth of an ampère).

In the arrangement of the apparatus to effect electric osmosis, the battery, the controller, the milammeter, and the patient are arranged in series.

In the analysis of the course of the current it is seen that the dentine is also a resister, and a most remarkable one at that, the resistance of the dentine varying, according to Dr. Price, from twenty to seventy thousand ohms, the differences being due to the distance of the pulp and to density of structure.

The result of the resistance of the dentine, unless the voltage is low and the ampèrage infinitesimal, is that at the closing of the circuit a slight shock is felt in some cases and the current may maintain some continued pain. The sense of pain occurs with different individuals at different rates of electro-motive force and at varying degrees of ampèrage.

The first sensation when the current has too much pressure is shock, and appears to be due to what is called impulse of the current. You will readily perceive from the law stated that electricity will not move through bodies which are non-conductors, under any degree of electro-motive force however great; but you

have daily observation that in the arc lamp the current leaps through the space between the carbons. This is due to impulse.

That the shock is due to impulse is shown in that in a moment, in a twinkling, this ceases and more current may be permitted to pass without pain until a definite degree of ampèrage becomes apparent.

When this latter sign of electrical irritation appears we have to consider, from the laws of electricity, that it is due to the evolution of heat, caused by resistance to the current.

There is great variation in persons as to the degree of ampèrage recorded when this form of irritation appears. With some it is at one-tenth milliampère; with others, it is not noticed until four-tenths are observed.

How shall we account for this difference where there probably is not a great variation in the tissue resistance? There is so little difference in the density of dentine that we have to seek for some other cause than difference of tooth resistance. You are aware of the well-recognized susceptibility of the teeth of different individuals to thermal shock. This sensibility of the teeth to elevation of temperature or to its reduction has been called the temperature sense of the teeth, and is a very variable state.

Some patients compare the electrical irritation to cold, notwithstanding the sensation must be caused by increased heat. This is to be accounted for by the fact that the usual form of thermal irritation is caused by reduction of temperature; as they have no comparison of the effects of heat, and not having the tongue or contiguous parts to guide them as to the temperature, they attribute it to the sensation with which they are familiar.

In the application of current, the occurrence of the first trace of electrical irritation—heat-pain, in other words—is designated as the pain limit. This should not be passed until there are indications, by the experiment, of very slightly reducing the resistance, that more current may be added. If this increases the irritation, the controller should he turned back a degree.

I think I have sufficiently indicated to you that the pain limit is due to the degree of ampèrage, and that this occurs with different persons at varying degrees of the ampèrage, and to the same person at a certain ampèrage regardless of the rate of the voltage.

You may here ask, What are the indications when the current has been continued with sufficient duration to effect the purpose of the administration? Do you wait until the electrical irritation ceases? In some instances, where there is little electrical irritation, where,

indeed, twenty volts will be tolerated, and where the record of the ampèrage is four-tenths of the milliampère, one may after eight or ten minutes carry the switch of the controller nearly the full circuit without disturbance; but, in general, when the pain limit occurs at one-tenth milli this result cannot be expected. In these cases the only measure is that of time, all the while keeping on the border of the pain limit. The usual time required is from ten to thirteen minutes, although I have known complete anæsthesia to occur after six minutes. In general terms, where the tolerated degree of ampèrage is low, more time is required than where three- to four-tenths milli is admissible.

In respect of electrical irritation, some value must be placed upon the high nervous sensibilities of some persons, as with these there usually appear greater susceptibility to electrical irritation.

The following table of calculated resistances makes it appear how considerable is the liability to the generation of heat in the dental tissues, in view of their density, and commands caution in the application of electrical force for the purpose in view:

With 15 volts initial pressure at $\frac{4}{10}$ milli, the ohms are	37,500
With 15 volts initial pressure at $\frac{1}{10}$ milli, the ohms are	150,000
With 10 volts initial pressure at $\frac{4}{10}$ milli, the ohms are	25,000
With 10 volts initial pressure at $\frac{1}{10}$ milli, the ohms are	100,000
With 5 volts initial pressure at $\frac{4}{10}$ milli, the ohms are	12,500
With 5 volts initial pressure at $\frac{1}{10}$ milli, the ohms are	50,000

As the varying resistance of the body, including the dentine, varies from twenty thousand ohms to seventy thousand, it appears from these calculations to be necessary that the controller should have at the highest point a resistance of at least one hundred and fifty thousand ohms to avoid the impulse of the current at the moment of closing the circuit. My experience, as before indicated, is that one hundred thousand ohms is not nearly sufficient.

The varying resistance through the body depends upon the density of the dentine, the distance the current traverses, the condition of the surface of the skin, as to its cleanness, its dryness, and the thickness of the adipose tissue at the surface where the cathode is placed.

The average resistance of the body, according to Dr. Price, is over twenty-five thousand ohms from cavity to hand. The difference of resistance from surface of tooth to hand and to the cheek is from three thousand to five thousand ohms. He reports a case where the resistance from cavity to hand, with a fifty-per-cent.

solution of cocaine, was twenty-eight thousand five hundred ohms, when, on placing the pad on the cheek, it was reduced to twenty-three thousand ohms. Hence the cheek is preferable to the hand.

But we must consider here the depth of the fatness of the cheek, and determine whether the palm, on account of the absence of fat there, may not give less resistance by the longer distance in the condition of deep adipose on the cheek.

Dr. Price further places the average resistance from hand to tongue at nine thousand ohms, and from cheek to tongue at three thousand ohms. This determines the average resistance of dentine to be about twenty-five thousand ohms.

The components of the anæsthetizing agent, as well as the percentage of the solution of the medicament, have a qualifying influence, as appears from the experiments of Dr. Price, where a section of dentine partially dry had a resistance of thirty thousand ohms; that, after being dried and saturated with a forty-per-cent. solution of cocaine, the resistance was reduced to four thousand five hundred ohms. This partially accounts for the slight increase of the degree of ampèrage after the cocaine has been continued for some time without increase of voltage.

The principles I have endeavored to make clear to you, and the facts presented in connection with them, demonstrate the importance of careful selection of the rate of initial voltage to be applied, and the use of a current of relatively low ratio of ampèrage to the voltage by the intervention of a controller of very high resistance; of the necessity to control the current a little within the boundary of the pain limit; of the avoidance of impulses of current by accidental displacements or movements of the anodal electrode, and of the maintenance of a constantly moist state of the medicated lint.

I will now come to a conclusion by directing your attention to some of the practical details of the administration.

The arrangement of the apparatus is to have the battery, the controller, the milammeter, and the patient in series,—the anode (positive) being connected with the cavity by the applicator, the cathodal (negative) conductor on the cheek or hand. The current is then turned on, selecting a voltage of ten to fifteen. The controller being at zero, the switch is gradually advanced until the approach of the pain limit is apparent. When this is at a low degree of ampèrage, say one-tenth milli, one should advance cautiously and wait until more strength of current will be tolerated, as nothing is gained by forcing beyond the condition of easy tolerance, since, generally, the desired result is reached with the same satis-

faction as in cases where, at the commencement of the pain limit, the milli may be three- to four-tenths. To those commencing the use of this method of treatment, cautious action is necessary, and, above all things, such persons should have studied well the general principles involved.

An apparent ampèrage of five-tenths milli is to be regarded as one of question as to the isolation of the tooth, and indicates leakage at the cervix. If it should be six-tenths, this becomes a certainty. If so, when this cannot be remedied, the proper course is to increase the voltage and cautiously continue the administration for a longer time than the usual period.

When the switch of the controller, after, say, six to eight minutes, may be advanced several points without transgressing the pain limit, it is positive indication, when no leakage exists, that the dentine has become anæsthetized, but it does not follow that relief does not come without this advancement, as cases appear where no change in the controller can be made, and where the recorded ampèrage is only one-tenth milli, that absolute relief is found after a continuance of ten to fifteen minutes of treatment.

When the indications point to conclusion, the switch should be slowly carried back to zero, and on removal of the connections the excavation may be made.

In some cases, while the major portion of the preparation of the cavity may be effected without pain, we may be denied the cutting of deep grooves at the margins, and may have to make a second application. This, however, is rarely necessary. If so, a short time only is required.

In this connection appears an interesting consideration. The question may arise in your minds, Why is it that, as electricity moves along the lines of least resistance, it does not take the direct course towards the pulp, through the dentine at the pulp-floor of the cavity, and avoid the portion of the dentine at the margins? But experience shows that this is not the case. The current is evidently diffused, and acts upon the margins, and universally does so. It evidently seeks the channels of the canaliculi in the stratum granulosum. It has been claimed by some that it reaches this portion of the dentine by first approaching the pulp, and, by anæsthetizing this organ, permits excavation to be made near the stratum granulosum. If this were the case, all parts of the margins, however deep and at whatever part of the cavity, would be acted upon, and would be insensitive. This is disproved by the fact that in some cases, by deep grooving at the margins, we arrive

at a point beyond the sphere of the anæsthesia. In addition, the point where we most frequently find the recurrence of sensibility is at the occlusal margin, which is the one where, by the general direction of the current, we might expect some sensibility. If the pulp were first acted upon, there should be no recurrence here.

This brings up another question. Shall we remove the caries from the cavity before commencing the treatment? On this point I have not reached definite conclusions. It has agreed, however, with my general observation, that it is better not to do so,—at least no further than to determine whether the sensibility is of such a degree as to necessitate the use of cataphoresis.

I have gone over this interesting subject in all its general features, and with particularity in those where this has appeared useful to beginners. There is so much that is of abounding importance connected with it that it is hard to find the point where there is not matter of interest and profit to state. No subject since the beginning of dentistry has caused so much discussion in so short a time, or which has excited such universal attention.

Therefore, it is my trust that I have not discussed it without a responsive interest on your part.

PRESIDENT'S ADDRESS TO THE AMERICAN DENTAL ASSOCIATION, 1897.

BY JAMES TRUMAN, D.D.S.

The annual gathering of a body such as this constitutes an ever-recurring era in dentistry, and should mean, to the reflective mind, a period of advance along all lines of work. If this fails to be realized, then the year has been valueless, and should be regarded as a period lost in the progress of the race.

The interest that has been manifested everywhere since the close of the last session of the American Dental Association, at Saratoga, indicates that the dental profession is fully alive to the importance of this meeting at Old Point Comfort, and of the possibilities which may accrue from its deliberations. I, therefore, wish to congratulate you on the fact that those here assembled have met upon a mission not second in importance to any of the meetings that have preceded this; and it may, perhaps, when the results have all been summed up, transcend all others; for, if the feeling be judged aright, we have reached the "parting of the ways," and

the rising sun of another day already appears above the horizon, illuminating the approaching century with a golden halo, indicating brilliant but as yet unfathomable possibilities.

The work of the past year will compare favorably with that of those preceding it, yet it must be conceded that the spirit of activity is not abroad in the land or in our profession. It is unfortunately too true that our calling tends to physical depression and disinclination to that higher work so necessary for advancement. The physical slavery which practice entails is not conducive to active mental effort, and the exhaustive day inclines to rest rather than to renewed activity during the evening hours. The result of this enforced inertia is to self-sacrifice, and the man of investigating mind will turn indifferently from the bank account to the solving of problems, and eventually he becomes not a practitioner but a laboratory devotee. Through this division of labor there has arisen a very small class who are the prophets of the age, and these are they to whom we have learned to look for the new ideas which mark progress.

The various reports will call to your attention the things new and old of special interest. It will suffice here to say that the practical side of dentistry has not exhibited any features during the year worthy of special comment. This, however, must be said, that the literature of this portion of our work has been greatly enriched by several notable productions, and while there has been little absolutely new, there has been marked improvements upon older methods of work.

The uncertainties attending the introduction of cataphoresis has received careful practical observation and quite thorough experimental tests, and this process is gradually finding its true level in practice. Its adoption by the dental profession has been certainly phenomenal, and this constitutes its greatest danger, for the unwise rush in and attempt the impossible, forgetting that pain is the sentinel upon the advanced picket-line and an ever-present warning of danger. To use this method to the best good of the patient means a high order of anatomical knowledge, as far as the teeth are concerned, and this point needs more and more to be impressed upon the dental mind everywhere.

The work in what may be called the scientific side of dentistry has received fresh impulse through the labors of Black, Andrews, and Williams, and the labors of dentists in England and on the continent have advanced our knowledge and aided in the solution of many abstruse problems. That a large portion of this work has

been accomplished by Americans is worthy of special mention at this time. It is recognized, however, that science knows no nationality, and any attempt to erect boundary lines should be crushed in its inception; but, while this is true, the fact remains, and it is one worthy of self-congratulation, that at last in our history a class has arisen in this country the equal of any similar body of unselfish men to be found among the older civilizations and worthy of the highest honor. This class must ever remain a small one, but it is to its efforts that we must look for the ennobling of our race on this continent in all the higher walks of intellectual life. In this connection it is befitting the occasion that we express our deep regrets and sympathy that the most brilliant exponent of this class, Professor W. D. Miller, is physically suffering from the great and exhaustive labors to which he has subjected himself. It is felt that all here assembled will send back to him the expressed desire that he may know a full restoration to health and activity.

The year has brought with it serious losses in our ranks, both at home and abroad. It is proper that we should stop in the busy whirl of daily duties and consider what these men were to us and what we owe to their memories. Their mission on earth has been completed, but the work they did is the precious heritage of their profession, and it should be our duty to treasure it, and add thereto, that the incoming century may feel the diviner inspiration to more exalted ideals.

The Committee on Necrology will, doubtless, present suitable resolutions upon the character and work of our revered members who have passed from the shadow of things to the eternal verities of the life everlasting.

To review a year is not difficult, but to grasp the progress made in a century is a problem from which the wisest and most cultivated might well shrink in dismay. The attempt will not be made here, but the near approach to the close of the nineteenth era of Christian brotherhood naturally causes a retrospection, and the query is ever uppermost, What have we stored up for our profession in the past one hundred years? It is a very glib expression, upon the tongue of the unthinking, that all we know of dentistry worthy the name has been acquired in this century. While the period has been fruitful in progress, the claim can never be made that we owe little or nothing to the one hundred years preceding. The intelligent student of dental history soon comes to recognize that we must moderate our claims and give credit to the last century as being worthy of our highest regard. It must be learned, further,

that this child of the professions—dentistry—was not born in America, but was nurtured in France, England, and Germany, and developed there upon a broad experience that made its fractional life here in America but a continuation of that of the years preceding.

While this is gratefully conceded, it must be acknowledged that dentistry has shown an increased vitality upon this continent, and the progress made has been proportionately greater here than elsewhere. Neither in the Old World nor in the New was there any real advance in this work until near the close of the last century, when porcelain teeth were introduced by Chemant, of France. Then, in the present century, came the introduction of arsenic for the devitalization of the pulp by Spooner, of Montreal; the filling of the canals; the revolution in surgery by the discovery of anæsthesia by Wells, and the introduction of ether by Morton, both dentists; the introduction of cohesive gold by Arthur; the adoption of the mallet, and the invention of the electrical mallet by Bonwill; the invention of the various forms of dental engines; the rubber dam, and, finally, the use of electricity as a motive power and as an obtundent. These are the prominent and marked stages which have been taken, each aiding to carry us forward to our present position. The countless details of minor improvements cannot even be mentioned here, but without their aid, all present know that the practice of dentistry would, to many, be almost impossible.

The crowning glory of the century, next to that of the discovery of anæsthesia, has been the solution of the problem of the ages,—caries of the teeth. While giving due prominence to the labors of a host of active investigators from the days of Leeuwenhoek down through Erdl, Ficinus, Klencke, Leber and Rottenstein, Milles and Underwood, Magitot, Tomes, we must give the credit for the final completion of the great work to Professor W. D. Miller, resident of Berlin, Germany, but native of this country. It is a special cause of congratulation that this investigation has been completed in this era and during the two decades that close the century.

It is also worthy of historical mention that dental education received its first impulse in Baltimore, Md., the adjoining State to that in which we are now assembled, Virginia, the Mother of Presidents. The wave thus started has been widening its circles ever since until it has embraced all civilizations. The progress in this direction is unexampled in professional educational work, and it is

safe to assume that it has not only reached an equality with that of general medicine, but, in some respects, has led that venerable mother into paths she had not thought of treading. The steady advance in the standard of dental education, the extension of the curriculum, the erection of noble buildings for dental training, the grasp of new ideas, are all signs of that activity which makes for progress. It was a natural sequence to this when Professor Winder, dean of the Original School of Dentistry, suggested the formation of a legislative body for all dental colleges, and the outgrowth of this idea was the formation of the National Association of Dental Faculties, not the least of the remarkable products of the century. To this organization we owe all of the advances made in dental education in the United States, and we, as a profession, may look forward with trustful confidence that its work in the future will maintain the high record it has earned in the past.

The natural and final result of advanced thinking and acting is law. A world without law would represent chaos, if such a condition be thinkable. Law, in the professional sense, is the embodiment of orderly rules of conduct, and should be recognized as necessary for the good government of dentistry as well as all organized bodies. The result of educational advance meant a proportionate demand for restriction,—law making. There is the natural law of all things which works for harmony, and there is the man-made law, which is very frequently a source of inharmony. The final outcome of this legal tendency has been laws in every State, a National Association of Dental Examiners, and a general feeling of disquiet among all teachers of dentistry as a consequence. Whether this product of the nineteenth century is to result in the good anticipated by those who worked for it remains yet to be seen, but it is hoped that this Association will see the way clear to formulate something that will tend to quiet the growing antagonism engendered by the unwise multiplication of statutes. The subject is a large one, and has frequently claimed the attention of my predecessors in office. As these laws at present stand, they are a dangerous obstacle in the path of professional progress, and promise to be the one blot upon the otherwise fair fame of the century in dental work. This applies not specially to individuals, for it is recognized that it is mainly the outgrowth of a mistaken sentiment that force, through law, will accomplish everything. The aim should be for unity of effort with the least friction State with State, accompanied with a positive recognition that the decree of one State should, in this matter, be a law for every citizen of the

United States. The Constitution of the United States expressly declares, Article IV., Section 1, "Full faith and credit shall be given in each State to the public acts, records, and judicial proceedings of every other State, and the Congress may by general laws prescribe the manner in which such acts, records, and proceedings shall be proved, and the effect thereof.

Section 2. "The citizens of each State shall be entitled to all privileges and immunities of citizens in the several States."

These quotations are apparently clear, and unmistakably point to two facts, that full faith and credit shall be given in each State to all the acts of every other State, and that Congress shall prescribe the effect of all such laws and how such shall be proved; and, further, that a citizen of one State shall be entitled to all the privileges of citizens of the several States. It is, therefore, clear that a law passed depriving a citizen who has been declared legally entitled to practise in any State from the privilege of registration in another State is unconstitutional, and it is difficult to understand how the Supreme Court of the United States could decide otherwise if a case should be carried before it for adjudication.

Out of forty-three States and Territories having laws regulating the practice of dentistry, in thirty-two the Examining Boards are appointed by the governors. In eight the State societies have the selection. In one the Board of Public Works selects. In another the selection of the board is partially made by the governor. In another the appointments are made by the Board of Health, and in the District of Columbia by the Commissioners of the District.

The graduates of the dental colleges of this country are subjected to the final decision of men who are not accountable to the dental profession, but owe their places to political preference. The boards may be, and doubtless are in many cases, composed of men worthy to fill such responsible positions, but how is it possible to determine this fact? It is not surprising, in view of the origin of the large majority of these boards, that the National Association of Dental Examiners should attempt to declare what should or should not be the curriculum of each of the dental colleges of the United States. The only apology that can be offered for this insidious blow at dental education is that it emanated from men who have no familiarity with dental teaching, and who have based their conclusions on impracticable theories.

It is not possible, perhaps, for the American Dental Association to legislate to correct this growing evil of State boards, as such action would be inoperative. It can, however, use its powerful in-

fluence, as the representative body of American dentists, to have all places on the boards filled upon the recommendation of State dental societies or by bodies having similar power. The suggestion made that persons to be eligible for State examiners should themselves be examined is certainly worthy of consideration, but at present there is no power to compel this, and it will be a long time, in the future, before a general law by Congress will be passed covering professional education in the States.

The deep responsibility of this occasion must be felt by every one here assembled. It means the old interrogatory, old as humanity, What shall we do to effect our salvation as a national organization? The hour has come for action, but the hour brings with it thoughts new and old. The past historical record of the American Dental Association is replete with undying memories, and the work accomplished should stir the mind to solemn reflections. In the background stand our dead brothers, and we can most truly believe that they point with uplifted arms to the future, and from the unseen comes the command, March on! For the progress of professions, as well as civilization, can only be accomplished through changes, the death of the old, the installation of the new.

The organization of societies in dentistry in the United States is but little over a half-century old. The condition of things in the dental profession in the thirties can scarcely be conceived by the liberal minds of the present. It was a period of isolation. The hand of every man was against his fellow-practitioner. The walls of prejudice were erected everywhere. Doors were bolted and barred against intrusion. Lips were sealed, lest they might disclose an important method of practice. Nowhere, throughout this progressive land in dentistry, was there any light upon the mediæval darkness. It, however, proved to be the period before the dawn. From behind all the clouds and shadows there was heard a voice proclaiming in no uncertain tones the old cry, "To your tents, O Israel!" but it fell upon deaf ears. It was the voice of Horace H. Hayden. With true prophetic inspiration he ceased not to demand that the dentists of the time should come forth from their isolation and, with something of the spirit of the old crusaders, unite and arm for the approaching conflict. The day came when Horace H. Hayden conquered, and in New York the first society was born into life, but died in its birth. Again we find this courageous pioneer at the head of the American Society of Dental Surgeons, and then, for the first time on this continent, began the true life of associative dental effort. We rear monuments to our great men and women,

but the only monument yet reared to Horace H. Hayden lies in the historical record of his deeds. Upon his neglected tomb I would lay this chaplet that the dental profession may never forget what it owes to this one man who labored that we to-day may live.

The past of the American Dental Association is familiar to all. It is a worthy record. It began its life amidst much confusion as to organization. It was the conservative embodiment of that intermediate thought between the crushing power sought to be enforced by the old American Society of Dental Surgeons and that extreme liberal sentiment embodied in the American Dental Convention. The organizers of the American Dental Association builded well for their day and generation, with the result that it has continued its active life for thirty-eight years. Has it fulfilled its destiny? Time alone can answer this profound question. We are here to-day to meet with our Southern brethren to attempt the solution of a difficult problem. The affectionate interest of long association lingers around their organization as well as our own. Is the ultimate result to be that we meet to-day, on consecrated ground, to bury our past loves, to scatter the elements of separation to the four winds of heaven, and over the ashes erect the new temple of which the fathers had no conception, a union of all professional thought upon a foundation that will sustain the superstructure for many years, it is hoped, far into the coming century?

The conditions under which the American Dental Association was organized made it impossible to effect radical changes in old methods. The period was replete with crudities in practice and theory. Colleges were few and not well arranged for the training of students. Ignorance prevailed of those scientific studies which were rightly regarded as essential to a true knowledge of the human organism. It was, therefore, impossible to form a strictly scientific body. Is this the condition at present?

Year by year the standard of training has been increased in our colleges through the wise action of the National Association of Dental Faculties, bringing us to a period of enlarged culture, enabling us to view calmly, and consider well, our relations to the present and to the future.

The organization of a body such as has been contemplated is a serious matter, and should not be hastily entered upon. It would not be proper in this address to do more than suggest a path that would seem to be the proper one to follow.

We live in the present, but must build for the future, or that future will take the matter out of our hands and destroy the work

of this day and generation. It is feared that the importance of this is not fully appreciated. The basis of all dental national organizations is derived from the American Medical Association. This, as stated, served its purpose well for that body, but in the American Dental Association has tended to weakness, so much so that the cry has gone over the land, the American Dental Association has ceased to be a body worthy our support! While this at no time has been true, the fact that such a statement has been heralded everywhere is indicative of a feeling that old methods have subserved their purpose, and a new order of things is demanded. In view of this, it would seem as though reorganization must, to be effective, be based upon an entire change of methods. Without attempting a solution of this matter, it may serve a purpose to point out what may be regarded as some things worthy of change in the old Association. The first step in a national professional organization should be the proper arrangement of local societies. From these the national body must be formed. These local societies must be in direct connection with the National, and therefore be established upon a careful, ethical basis, and a positive standard of entrance. This, as a rule, is entirely neglected, resulting in a membership of uncertain quality. The representation to the national body is selected with more regard to availability than to qualifications. These delegates, if so disposed, became permanent members of the national organization, and eventually became part of the controlling body. In proportion as this grows will it become unmanageable and lose its scientific character. This is the history of all similar bodies so constituted. Science does not, cannot flourish in crowds.

The question, then, would seem to be, Can reorganization be accomplished upon a different conception? It will be difficult to change present methods in local bodies, but proper legislation in the national organization could in time effect much. A glance at the present and past condition of the American Dental Association may prove of value. The ineffectual efforts to increase the scientific work led to the formation of sections, under the supposition that these would tend to concentrate the labor and accomplish more than when left to the efforts of committees. The result has been no improvement over older systems. This is not stated as a complaint, for it is recognized not to be the fault of individuals but of methods. The system is intrinsically weak, and can never effect any permanent good results.

The first fatal injury done to any organization is to found within

its borders an aristocracy. This has been accomplished in this and similar organizations by the establishment of what is known as permanent membership. This has been the deadly poison that has eaten out the life of this American Dental Association. It was an aristocracy not based, as it should have been, as a prize for higher work, but was upon ability to pay the yearly fee and attendance at the annual meetings. This separated most of the desirable element in the profession, and, as a consequence, very little of the real scientific work has been done within its borders.

If these views be accepted, it would seem worthy of our careful thought whether it is not time to originate a body distinct from all others, and which should embody elements of strength rather than weakness.

The idea which this address seeks to impress is that a national body should be the culmination of all below it. It should embrace the concentrated wisdom of all subordinate societies. In order to make it thus the affiliating organizations should send to the national only such members who had given the profession satisfactory work. Their entrance and continuation in the national could be arranged so that the latter would always be an active, living organization. The only aristocracy admissible should be a class, set apart, who had earned special honor. This would never be a large number, and might be selected from the main body with an honorary title.

With this care in the selection of members the national body would always remain within working limits, and would partake of the character of the higher scientific bodies of older civilizations.

The suggestions here outlined will not in all probability meet the views of the majority, but it is hoped that if a new body be formed out of the two present organizations that it will embody, at least, some improvements over those long in existence. They have been tried and found wanting in those essentials that work for the highest good of the dental profession. It will not be disputed, it is presumed, that a national body is a necessary part of the organization of a profession. This recognized, it should be the aim of those having the matter in charge to make it worthy the respect not only of the present time but of the future.

The recent meeting of the American Medical Association in Philadelphia demonstrated that the divisions into sections, to meet separately from the main body, is not a satisfactory method. It is questionable whether much good is derived, even in medicine, from this practice, where specialties are more clearly pronounced and

certainly more desirable; but in dentistry there is no such demand. We are, or should be, interested in every portion of our work, and can, therefore, meet on common ground, enlarging our horizon of thought and experience, and at the same time cultivate those social amenities so important in maintaining good fellowship among widely separated members of the same professional family.

The experience of the past few years has demonstrated that it cannot be expected that the regular practitioners of dentistry will, outside of a few isolated instances, work for the advance of his profession, if it interferes with his daily work. The altruistic side of dentistry needs cultivation, but it will never assume large proportions. The true investigator of problems invariably finds practice irksome, and he is always ready to burst the bonds, if necessary, which environ him for the more enjoyable fields of the mysterious unknown. Few there are who can do this with that other problem—daily bread—staring them constantly in the face. It would seem, therefore, that the time has arrived when some means should be arranged to set free these imprisoned students and make it possible for them to work independently of the cares of life. When the new organization is perfected it is hoped the possibilities, in this direction, may be considered, and that a fund may be established looking to financial aid to those who are continually sacrificing themselves, and those depending on them, that the profession may progress worthy of its high aspirations. Science seeks the cloisters in the world's life. Is it not time that we make those cloisters free from worldly anxieties?

With our faces averted from the past and present, and directed to the opening of the new day, we can consistently ask, What of that great future that lies before us? Who has the prescient wisdom to fathom its possibilities? It is the as yet uncultivated plain; its mines have not been laid bare with pick and shovel; its gold and precious stones still remain environed by the accumulated mire and rocks of undetermined time; but over all these floats the spirit of progress, and her wings are never idle, nor will she be found wanting in inspirational power to influence men to work out the problems of the coming ages. The promises of that future will assuredly meet with full fruition, and we can confidently anticipate that, inasmuch as we have builded well with imperfect tools, they who come after us will rear more substantial structures and carry the profession of dentistry to a standard as yet unthought of in our wildest imaginings.

Men of the North, South, East, and West, here assembled, on

ground consecrated by the martyrdom of many heroic spirits, can you not come together actuated by that same high sense of duty that led the thousands to sacrifice all of life's treasures for the good of others, and pledge yourselves to a renewal of effort to complete brotherly relations, and, forgetting the old and grasping the new, move onward in fraternal harmony towards the anticipations, the possibilities that lie entombed in the ever-developing future, the heritage of the incoming civilizations, which should prove the blessing of humanity; the ennobling of the professions, and the upbuilding of the life and intelligence of all the peoples of the earth.

ANCIENT METALLURGY.[1]

BY HENRY LEFFMANN, M.D., D.D.S.[2]

Although it is the main object of this Society to discuss questions of actual dental practice, yet it has not been unwilling to turn its attention occasionally to theoretic subjects. The topic that I offer to-night is one that will not bear lengthy or frequent discussion, but it is not without interest, and to no specialists of medicine would it be so interesting as to dentists. Metallurgy forms a distinct feature of dental education. It is usually part of the title of some Faculty-chair in dental colleges, and its history cannot be entirely without interest.

Every one who has any knowledge of the history of chemistry knows that at one period the efforts of investigators were largely directed towards producing the precious metals from cheaper sources, and especially from the so-called base metals. As in so many other cases, however, accurate information as to the aims and methods of the alchemists is not wide-spread, and it was partly with a view of bringing some trustworthy data before you that I offered this paper. A very brief review of some general historic questions will be appropriate as an introduction.

The origin of chemistry is lost in the obscurity of antiquity. Even the derivation and significance of the name have been subjects of dispute. The Greek form "chemeia" is first noted in a

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[1] Read before the Odontological Society of Pennsylvania, February 13, 1897.

[2] Professor of Chemistry and Metallurgy in the Pennsylvania College of Dental Surgery.

work of the fourth century of our era, although doubtless much older. It is now regarded as a Greek rendering of a name applied to Egypt; the word also means black, and various suggestions have been made concerning this. An eleventh century writer defined chemistry to be the art of preparing silver and gold.

Metallurgy must have been one of the earliest phases of chemic work. This would be expected *a priori*, and is shown by the allusions in the earliest records among various nations. The Hebrew Scriptures are regarded as containing references to six metals,—Au, Ag, Cu, Fe, Pb, and Sn. According to Pliny, the name metal (Gr. *met'alla*) is derived from the fact that they occur in association with others in veins, but other meanings are also given. The precious metals, gold and silver, which occur native, and have many striking properties, were in use at an early period, and there is evidence of the use of iron in Egypt in very early times. An incidental reference, showing the considerable antiquity of common metallurgic operations, is that in Proverbs xvii. 3: "The fining pot is for silver, and the furnace for gold: but the Lord trieth the hearts." The date is probably 500 B.C.

Positive evidence of the antiquity of the use of certain metals is obtained from the remains of ancient cities and temples. There has been so much successful digging during recent years that much of the hitherto-accepted ancient history has been overthrown, and it is unwise to express positive opinions as to the details of ancient civilization; but the following notes collected from some recent authorities, and seemingly trustworthy, may be offered:

Schliemann found in one of the layers in the mound at Hissarlik, supposed to be remains of Homeric Troy, articles of gold and silver, a bar of pure copper, and shapeless masses of lead. Leaden objects are uncommon among Egyptian remains, but Diodorus states that sheet-lead was used in the hanging gardens of Babylon. The oldest coined money known is that of Lydia; it was an alloy of gold and silver. The Greek and Roman bronze coinage from 500 B.C. to 50 B.C. contained from three to thirty per cent. of lead. This may have been put in to render the metal more fusible, but it may also have been a deliberate debasement by the government. References to lead occur in Homer and several other ancient writers. Mr. Eckfeldt, assayer at the United States mint at Philadelphia, has kindly given me a summary of the analyses of the Roman gold and silver coins in the mint collection. From this it appears that during the pagan period the coins were generally nearly pure metal.

In excavations at the site of the palace of Sargon, at Khorsabad,

in 1854, votive tablets of different materials were found, to which a date of 700 B.C. is assigned. Four of these were examined by Berthelot; one is nearly pure gold, one nearly pure silver, one an alloy of tin and copper, much oxidized, and one magnesium carbonate. Another ancient article, a fragment of a vase, from a similar source, was found to be nearly pure antimony. This fact is quite remarkable, because pure antimony is even to-day very rarely employed, though its alloys are common. A votive figure from the same place was found to be pure copper, oxidized, however, to considerable depth.

These isolated instances are sufficient to show how early metallurgic operations began. Before passing to the consideration of alchemy, I wish to call attention to a feature of ancient metallurgy that has little to do with dentistry, but will be interesting because new to many. I refer to the use of lead pipes. This was quite familiar to the Romans. Tons of lead pipe have been dug up in various parts of Italy, and it has also been found in other parts of Europe that were under Roman domination. This pipe was made by folding sheets and securing the junction either by running melted lead along it or by the use of cement. Very often the name of the property-owner or of the plumber was imprinted on the sides of the pipe. Lanciani, the Italian archæologist, has described many of these inscriptions, and we learn, among other things, that women-plumbers were quite familiar to the ancient Romans. Such names as Julia Paula, Fabia Glycera, Aurelia Irene are among those given by Lanciani.

Vitruvius, a Roman writer on architecture, who lived about the beginning of the Christian era, refers to the danger of chronic lead-poisoning from water passing through lead pipes. I have a few lantern illustrations of Roman pipes and their applications.

Let us turn our attention to the special topic of alchemy.

Whatever may have been the aspirations and efforts of the ancient Greeks and Hebrews towards the transmutations of metals, they have left no definite evidence in their literature of efforts in such directions. The Jewish mind, in antiquity at least, was not scientific; and the Greek mind failed to grasp the true scientific method; in fact, the Greek philosophers disdained and condemned systematic observation and experiment. In later centuries, works were written and fraudulently ascribed to noted ancient personages, such as Moses, Democrites, Hermes, Solomon, Alexander, or Cleopatra. Indeed, it is very difficult to separate fact from fable and genuineness from fraud in this line of inquiry. As an example of

this kind of apocryphal writing, I will refer to a paragraph in a manuscript of the eleventh century which is termed the "Diplosis of Moses,"—that is, a receipt originated by Moses for doubling the quantity of gold. A somewhat confused list is given, in which the words copper, sulphur, arsenic, lead, and sandarach are mentioned, though there is a little uncertainty in some of the terms; then a process of manipulation, which lasts for three days. We are then told that the added alloy will all be converted into gold, with, as the writer wisely adds, "the grace of God."

Within the past decade considerable accurate information concerning the alchemists has been brought into a readable form by the labors of the well-known French chemist, Berthelot. It had long been known that there are in some of the great European libraries Greek manuscripts on alchemy. Under the patronage of a department of the government of France, and assisted by various specialists in archæology and philology, Berthelot succeeded in sifting out much important matter from these writings and making *fac-similes* of some of the texts and illustrations.

The oldest of these manuscripts is now in the library at Leyden, in Holland. It is a papyrus, partly in Greek and partly in demotic character, found in a tomb at Thebes. It is believed to have been written in the third century of the Christian era, and is the oldest authentic manuscript of Egyptian alchemy. It is probably one of the few books that escaped the general destruction of books on alchemy and magic ordered by Diocletian about the close of the third century. It contains a long list of metallurgic receipts written in bad Greek, and is considered to be a sort of memorandum receipt-book of a metal-smith. The receipts show that a large part of the earlier alchemy was devoted to deliberate falsification. Manuscripts of later date, though still quite ancient, are also known. In these are found allusions to the relations between the planets and the known metals, also pictures of apparatus, and many mystical signs and obscure formulæ. I have had a few of these reproduced as lantern-slides, which will be shown later. The text of the oldest Leyden manuscript contains over one hundred receipts, from which a few may be taken as examples. Unfortunately, the translation is not always positive. Names that seem familiar and intelligible to us may not have the significance that we assign to them. Thus, magnesia is now understood to mean magnesium oxide, but in ancient writings it often means an iron oxide, magnetic oxide (Fe_3O_4), or even some other dark mineral. Sal ammoniac now refers to ammonium chloride, but originally it was applied to another sub-

stance not definitely understood. The term "chalk" is used with reference to a form of clay used as a flux.

There is some prominence given to receipts for the manufacture of an alloy called "*asem*," which is sometimes made of copper, tin, and mercury, sometimes of tin and mercury alone, sometimes more complex. Here are some translations from the receipts:

"*Manufacture of Asem.*—Tin, twelve drachms; mercury, four drachms; Chio earth (a sort of clay), two drachms. Add the powdered earth to the melted tin, then the mercury, agitate with an iron rod and allow to cool."

"*Another Receipt for Asem.*—Take tin in small and soft pieces, four times refined, four parts; pure white copper, three parts; asem, one part. Melt these and then purify the mass several times, and it is ready for use. It will be asem of the finest quality, which will deceive experts."

Here we have an evident intention to deceive by an alloy resembling silver.

Another receipt gives a method for augmenting gold,—namely, adding an alloy of copper and lead, with perhaps zinc, for some of the terms used are obscure.

You will all doubtless be interested in a receipt, written more than sixteen hundred years ago, for making gold-solder: "Gold, two parts; copper, one part; melt and granulate. If you wish a more brilliant color, add a little silver."

It is not necessary to multiply details. The text of these receipts shows a merely empiric metallurgy. Here and there we note a mystical trend, which becomes more marked in later writers. The ancient conception that all matter originates from one form contributed towards a belief in transmutation, and when motives of cupidity had led to the discovery of methods of imitating the precious metals by alloys which deceived even experts, it was no very great step to self-deception and the development of the futile search for the philosopher's stone.

An interesting feature of the early metallurgy was the supposed relation between the metals and the planets. We retain many traces of this to-day. Lead-poisoning is often called saturnine poisoning, silver nitrate is called *lunar caustic*, the preparations of iron are called martian preparations. By a chance, the number of moving stars visible to the naked eye is also the number of days in the quarterly period of the moon, and interesting usages have grown out of this coincidence, the discussion of which is not appropriate here. Various coincidences of a superficial character tended

to connect the metals with the planets. The brightness of the sun accords with the rich brilliancy of gold; a very ancient allusion to this is in one of Pindar's odes. Similarly, the whiteness of silver corresponds to the paleness of the moon. The redness of Mars suggested iron, the bluish tint of Venus accorded with the lustre of the salts of copper. The dulness of the lustre of lead suggests a comparison with that of the planet Saturn. The assignments of Mercury, "the sparkling," and Jupiter, "the resplendent," have varied somewhat.

The list of relations between planets and metals has not always been as we now give it. In the earliest times certain alloys were regarded as distinct elements and classified as such. Thus, a natural alloy of gold and silver, called "electrum," and supposed to be a pure metal, was assigned to Jupiter. Tin was originally assigned to the planet Mercury, but later to Jupiter, when the metal, mercury, then called *hydrargyros*, was assigned to the innermost planet, to which its quick motion and sparkling lustre well suit it. Mercury was not known to the more ancient nations, but appears to have been discovered about 300 B.C. It was at first regarded as a sort of allotropic silver, if I may use a modern term, and represented by a crescent reversed, silver having been represented by the crescent upright. The notion that the native alloy of gold and silver, called electrum, is an element is found as late as the sixth century, in the work of Olympiodorus. Concerning this alloy there arose the not unnatural view that it could be made to yield either gold and silver at will. At the present day such a property would at once be regarded as proof of the existence of the two metals in the mass, but in earlier times such an explanation would not be suggested. The precipitation of copper from its solutions by the action of iron was regarded as the conversion of iron into copper; the small button of silver obtained by cupellation of lead-ores was regarded as a conversion of lead into silver. We know now that the silver is present in the original mass, but these ideas, which seem so simple and obvious to us, are matters of comparatively recent development.

The Egyptian alchemists regarded lead as the source of other metals, and as containing the transmuting agent; indeed, the term which we now translate lead originally covered any metal or alloy that was white and fusible. It will not be necessary to follow this phase of the subject further, and I pass to some brief allusions to forms of apparatus.

Enjoying as we do at the present time the benefit of instruments of precision and methods of inquiry by which opaque materials are

open to our examination, we cannot appreciate the difficulties of manipulation under which the earlier workers labored. Even as late as the year 1777 we find Carl Wilhelm Scheele using pigs' bladders for collecting and studying the gases of the atmosphere.

The forms of apparatus that are figured in the alchemic manuscripts are principally those of distillation and crucible operations. Those that I will show on the screen are copies of Berthelot's *facsimiles* from a manuscript of the eleventh century now at Venice. There are inscriptions on various parts of the figures, and probably some of these were actually written on the apparatus, for these workers often mixed mysticism with practical ideas. Figures of similar apparatus are found in a fifteenth century manuscript now at Paris, and although there are some changes, yet we are still struck by the slowness with which progress was made when the lapse of four or five hundred years did not bring about complete abandonment of the older forms.

In regard to ancient metallurgic operations, it must be borne in mind that the ancients worked largely with mixtures of various ores, by which they obtained alloys at once, and, under the views then generally received, these alloys were regarded as single substances. We may smile at this: but when the nineteenth century began, chemists still regarded caustic soda as an elementary body. It will not be worth while to pursue this subject further, for it will become tedious. Indeed, I fear there has been already too much archæology and too little metallurgy. Before I pass to the lantern illustrations I wish to say a few words concerning the modern views as to the nature of alloys. Students often ask me if alloys are mixtures or compounds. If I pause to reflect before answering the question, the answers that float successively through my mind are: yes, no, both, neither, I do not know. The fact is that, until we can exactly define what we mean by mixture and combination, we cannot answer the question. We can, however, be sure that several different degrees of association exist in many alloys, and the probability is that most of them contain some of their constituent metals in a degree of association as close as we would expect in a combination, and this compound is mixed with the mass of the metal that is excess. For example, an alloy of ninety parts of silver and ten of copper probably consists of a compound of the two metals dissolved in—that is, mixed with—silver. It is, moreover, quite evident that the properties of many alloys are materially affected by slight impurities, among others, by the slight oxidation which

almost all metals undergo when melted, and I think is an interesting line of research open to the one who will prepare alloys of absolutely pure ingredients.

We will now turn to the lantern illustrations.

THE STUDY OF ANATOMY.[1]

BY W. C. BARRETT, M.D., D.D.S., M.D.S., BUFFALO, N. Y.

THIS association has wrought a great work in securing the adoption of something like uniformity of action in the admission of students, and in the raising of the general educational standard. If one would have some comprehension of its beneficent influence, he has but to reflect upon what was the general character of American schools, and what their reputation abroad before the organization of the National Association of Dental Faculties, as compared with the present condition. And yet it has done but a small proportion of its manifest duty. Its accomplishments have been elementary.

It is not too much to say that our professional reputation must be what our colleges make it. We are the educators of those who are to be the leaders in the professional matters of the future. The next generation of dentists will be what we shall make it. Legislators may pass laws to regulate and restrict dental practice, but the stream can rise no higher than the fountain-head, and the practitioner of to-morrow must get his training and derive his professional knowledge from the school of to-day. He must enter the profession by submitting himself to our guidance. The colleges are the fountain-head, and the stream will be limpid or foul according to whether we purify or contaminate it.

This should be a proud position. It certainly is a responsible one, and woe betide the college professor who does not realize his accountability. The man who accepts the honor which may appertain to this distinguished station, without striving his utmost to be in every way worthy of it, to fulfil every duty with an eye single to the best interests of student and profession, is unworthy a place in our ranks. He who assumes to arm the young men of our country for the battle of life, to fit them and equip them for an hon-

[1] Read by request before the National Association of Dental Faculties, Old Point Comfort, July 31, 1897.

orable career simply that he may minister to his own good, who takes the teacher's place and ascends the instructor's rostrum from selfish motives, is a worse hypocrite than the preacher whose every-day life belies his own sermons.

I believe that we are all sincere in desiring to make our schools, and through them the profession, all that they should be. To secure this it is not enough that we look solely to the preliminary qualifications of those whom we accept as candidates for a confidential position in American families. We need to make our instruction as perfect as possible. This cannot be done unless there is a generally accepted standard, and some uniformity in system. At present one of our greatest sources of weakness lies in the fact that there is no common comprehension of a standard of methods. One school begins instruction with the alphabet, proceeds to the construction of simple words, and by regular gradations to the building up of sentences. Another commences by an analysis of the sentence into its component words, and then studies the elementary symbols constituting the words.

That is, one teacher is synthetical and the other strictly analytical. A student takes his first and second year in one school, and then circumstances or inclination cause him to finish his course at another. He commences under analytical teachers, and closes with a school that only arrives at the stage of analysis in the closing year. Hence, in reality that student never reaches the end of any regularly graded course. In this way the practical efficiency of that graduate can never be assured. Let me illustrate this by the various methods of arriving at a knowledge of that basal study in all schools that attempt to teach the healing art,—anatomy.

Some teachers open their course with an examination of the elements of which the human body is composed. That is, they begin with histology. They commence with the cell, and after having given a fair knowledge of that, they proceed to construct the cells into tissues, which are then considered. Then the tissues are built into organs, and finally the organs into the systems which they compose, and they do not arrive at a consideration of the human body as a whole until the last year.

Another pursues the opposite course. He begins with a study of the anatomy as a complete system. He considers its functions, and then goes on to study the organs whose actions make function, and finally to the ultimate elements of which organs and tissues are composed, and whose aberrant functions afford the pathological disturbances with which it is to be his life's work to battle.

The student who spends his first year in a school that begins with histology, and who goes to one that ends its course with tissue elements, never gets beyond elementary matters in his entire college training. This certainly will not tend to make the best practitioners, or to raise our profession to its highest point of efficiency. There should be a comprehension of the benefits of each method, a careful discussion of the merits of all systems of teaching, and an intelligent and discriminating adoption of that which is best. To this end I have accepted the invitation of the Executive Committee to bring this subject before you.

I am a believer in the analytical system. I think it is easier to arrive at an understanding by taking in pieces that which we do not construct, and thus get at a knowledge of the mysteries of that which we must attempt to repair. Let me give you my reasons for this faith, and then please allow me to listen while you show me wherein I am wrong, or confirm my prepossessions by your own corroborative testimony. Do not then understand me as speaking dogmatically when I propose the following methods in teaching anatomy, but only as offering suggestions.

Our sole reason for examining tissues and organs is that we may learn their action and function. Hence, we should begin with function. This requires that the preliminary examination should be of the system, and not of its organs. The study of anatomy, then, should commence with a general examination of the body as a whole. In a dental school the first year should be devoted to general anatomy, beginning with osteology, or the framework. Then the viscera should be taken up, and their general morphology and function should be studied. This should be followed by myology, syndesmology, and neurology, that a fair idea of the whole body may be obtained. Practical anatomy should be commenced this term, and one extremity dissected. It has sometimes been urged that the student should not dissect until he has learned something of anatomy. This argument would be cogent if the object were to learn how to dissect. But we dissect to learn anatomy, and do not learn anatomy to discover how best to dissect.

All the study of this year should be general. Not a hint of any specialty should be given, and hence the teacher for this year is preferably a medical man. If he is a dentist, he is apt to introduce his specialty too early. The general study of the human body should be finished in the freshman year.

In the second, or junior year, the student begins to differentiate in his study. He should now take up regional anatomy. He

has finished the study of the body as a whole. Not that he has learned all that he should, but he has devoted all the time that can be spared out of a three years' course, and he takes up the study of the part to which he is to devote his attention as a specialist. His field is bounded below by the clavicle, and he must have a special, definite, intimate knowledge of all above that.

As a part of this he commences the study of dental anatomy. The first step in this is comparative dental anatomy,—that is, the study of the dental organs as a whole, precisely as he began the first year in general anatomy. The dentist who learns nothing of the general relations of the teeth, and whose comprehension of them is only that they are organs out of which he is to pick his living, cannot claim any scientific knowledge. The teeth in all the different classes of animals should be generally studied, until the dentition of man is reached, when his teeth should be intimately studied in all their anatomical relations. The anatomy of the second or junior year is, as a whole, devoted to organs, as is that of the first year to systems.

No man can finish the anatomical studies necessary to dental practice in two years. He imperatively needs the third year, and this should be given up to careful examination and investigation of tissues. In this year the microscope is a necessary adjunct. The student has now learned enough of function to comprehend how it modifies, or is modified, by structural development. In this third and finishing year he does not entirely confine his attention to histological anatomy, but he continues regional anatomy, because he is not yet sufficiently familiar with the organs, especially of the head. He also bestows considerable attention upon surgical and morbid or pathological anatomy. But his chief attention is given to structural or histological anatomy, and he thus finishes his course by attention to the minutiæ and detail for which he is unprepared during his first or second year, because he has not then the general knowledge to allow him fully to comprehend it, and because his mind usually is not sufficiently trained and disciplined to give him mastery over his attention.

The student who thus advances by regular gradations each year, separately taking up and mastering a definite branch or part of the subject, will be likely to retain his knowledge, because he has advanced towards it by a direct route, and because each division is made subsidiary to the next, and there is a regular gradation and progress.

If such a system, or if some other regular system, can be adopted

in its general features by all of our schools, the grading of one who for any cause changes his college during his course will be greatly facilitated, and he will not be likely to miss any of the subdivisions. Our graduates will be better qualified for practice, and the tone of the profession will be elevated.

I would pursue the same general plan in the study of chemistry and physiology, the other basal studies of the theoretical curriculum. They should extend through the entire course, the last year in each to be devoted to special instruction adapted to an exclusive dental practice.

Materia medica should begin with the first year, but therapeutics cannot be profitably commenced until the student has obtained some knowledge of drugs, and hence it becomes a second- and third-year study, materia medica extending over the first two years.

Embryology properly belongs to the second year, because its study demands an acquaintance with technical terms that are all unfamiliar at the outset, and because it is an intricate and involved matter which requires a disciplined attention. Aside from these, there is no reason why it might not be begun with the freshman year.

Metallurgy is a second-year study, because its consideration demands a good acquaintance with general chemical laws, and these are acquired during the first year.

Surgery is a third-year study, because it demands not only a complete knowledge of anatomy, but a trained hand and absorbed attention as well. The student should begin the study of surgical pathology in the second year, and it may perhaps form a part of his general pathological studies.

Pathology should be differentiated from operative dentistry. They have very little in common, save that each may be curative. But operative dentistry is wholly mechanical and manipulative, while pathology should cover all medicinal and general treatment. Operative dentistry is largely prophylactic, while pathology is so to but a slight degree. Whatever has to do with the action of drugs, whether generally or topically applied, belongs to pathological practice. In the treatment of alveolar abscess, for instance, operative dentistry has very little part, its practice being confined to that which is mechanical, or that which is done with instruments. I believe that in the past we have not sufficiently distinguished between the two. A sharp line of demarcation should be drawn between that which is mechanical and that which is therapeutical.

It will be seen that I have not attempted to assign any place to the practical part of dentistry. My subject was the teaching of anatomy, but I have thought it not inappropriate to suggest some thought concerning other didactic studies.

Let me repeat that I have only considered the matter tentatively, and realize as fully as any of you that there is room for much consideration and extended discussion before the various studies in our curriculum shall each have been definitely assigned its appropriate place.

Reports of Society Meetings.

AMERICAN DENTAL ASSOCIATION.

The Thirty-seventh Annual Session of the American Dental Association was opened in the winter ball-room of the Hotel Chamberlain, at Old Point Comfort, on Tuesday, August 3, 1897, at eleven o'clock, A.M., the President, Dr. James Truman occupying the chair.

On motion, the calling of the roll and reading of the minutes was dispensed with.

The Secretary, Dr. Cushing, read the resignation of Dr. Morris L. Chaim, which was accepted.

The report of the Publication Committee, read by Dr. Cushing, showed that the transactions were printed in the usual manner and distributed among the members, libraries, etc., about seventy copies being still on hand. The report also presented an account of the money expended by such committee.

Referred to the Finance Committee.

REPORT OF THE EXECUTIVE COMMITTEE.

Dr. Crouse.—As chairman of the Executive Committee, I sent to all the members two communications. I sent out a list of subjects early in the spring, with the request to take them up and discuss them, and give us a synopsis or digest of their work for the year. Later, I sent another communication giving railroad rates, and urging attendance at this meeting. During the spring I came here to look after the arrangements, and decided upon this hotel as being the best one for us. I chose this room for the meetings, with

the understanding that if it were not satisfactory it could be changed. This large meeting-room and the smaller committee rooms are given to us by the hotel free of charge, and I was enabled to make a rate of $2.50 per day.

I also made railroad arrangements for the different roads, except the Western Passenger Road, which would not give us any rates. The programme presented is the one arranged for the meeting, although we can make changes in it from time to time as is considered best. I will present the bills for expenses later.

Report received and approved as far as given.

The treasurer's report, by Dr. Henry W. Morgan, was as follows:

Balance on hand at last report	$1294.28
Collected at Saratoga, and since	1080.00
Total	2374.28
Expended	768.94
Leaving on hand	$1605.34

The expenditures were as follows:

Salary of the Secretary for 1896	$200.00
Salary of the Treasurer for 1896	100.00
Reporter for session of 1896	125.00
Printing, expressage, and postage	134.20
On account of National Museum	53.95
Executive Committee expenses of the Saratoga meeting	78.59
Publication Committee	40.00
Expenses of Section I.	15.00
Expenses of Section II.	11.20
Expenses of Section IV.	6.00
Refunded dues, one member	5.00
Total	$768.94

Report referred to the usual committee.

COMMITTEE ON HORACE WELLS MEMORIAL.

Dr. Cushing.—I have a communication from Dr. J. D. Thomas, of Philadelphia, giving a statement of account of the Horace Wells Memorial Fund, as follows:

Amount of subscriptions to date		$1057.73
Expenses	$68.01	
Unpaid subscriptions, A. D. A.	250.00	
Unpaid subscription, Richmond Dental Society	50.00	
Unpaid subscription, individuals	12.50	
		380.51
Amount in bank		$677.22

Report placed on file and referred to Publication Committee.

COMMITTEE ON STATE AND LOCAL SOCIETIES.

Dr. Crouse.—I tried to get a closer relation between the local societies and this society. How successful I have been will be seen later. As to Section III., Operative Dentistry, I sent to the secretary of that section a card to be mailed to all members of the American Dental Association, asking them to bring samples of the amalgam they were using in their practice, so we might make tests here with the micrometer, dynamometer, and other scientific means. We will have a clinic for that purpose, which will take a day or two probably.

COMMITTEE ON NATIONAL MUSEUM.

Dr. Donnelly.—We have not been able to meet, so we ask for further time to make our report.

Request granted.

The Committee on Necrology also asked for further time, which was granted.

The Committee on Violation of the Code of Ethics, through Dr. Jackson, reported progress, and asked permission to present a fuller report later in the session.

The Vice-President, Dr. Thomas Fillebrown, then took the chair and the President read his address.

(For this address, see page 563.)

Dr. Truman, having met with a slight accident, the discussion on his report was deferred until the evening session, and the meeting adjourned until half-past seven.

(To be continued.)

THE NEW YORK INSTITUTE OF STOMATOLOGY.

A REGULAR meeting of the Institute was held Tuesday evening, May 4, 1897, at the residence of Dr. S. E. Davenport, No. 51 West Forty-seventh Street, New York City. The President, Dr. George Allan, occupied the chair.

Dr. G. A. Wilson.—I have here two volumes,—the report of the State Board of Health of Connecticut for 1895 and 1896,—forwarded to us by Dr. George L. Parmele, recorder of Dental Com-

missioners of Hartford. I have extended the thanks of the Institute to Dr. Parmele.

COMMUNICATIONS ON THEORY AND PRACTICE.

Dr. J. F. P. Hodson.—I have the pleasure of presenting to the Institute a little device which has recently become of very great value to me. I have never used any of the usual matrices that have been offered to the profession, for the reason, among others, that they are chiefly but variations of a straight band around the tooth, which produces in the finished stopping a convexity in only one direction, and in its longitudinal aspect a surface as literally flat as if a file had been run between the teeth, and having little or no real adjustment to the cervical edge of the cavity. I want the rotundity to be a real and complete one. There is just as great necessity for the convexity to obtain from the grinding surface to the cervical as from the buccal to the lingual. Some years ago I conceived this little appliance, and have used it since so continuously that it has come to be quite as important as my rubber dam, or anything that I depend upon for aid in my daily practice. These little matrices are simple, delicate, easily made and applied, and, while doing their duty well, are so little offence to the patient that they may be—and should, for amalgam—left in place until the next sitting. The material is very thin steel. (I happen to find a very suitable sort in that which the women employ for the bottoms of their gowns.) After annealing slightly, cut it with scissors to the different sizes and general shapes of the approximal aspect of the tooth, pass a file around all its edges to smooth it for the tongue, and also to prevent any burred edges interfering with its slipping to place, punch a tiny hole near the buccal and lingual edges for convenience of removal, then place the strip on a piece of lead and strike with the hammer a small convex bead held upon it (I use a small, round-headed picture-nail, which I case-hardened and polished), thus stretching (not merely bending) the thin steel into a concave condition in every direction. It is quite easy to give in a moment just the convexity needed for the individual case, and it is sometimes of value, in irregularly placed teeth, to convex it more on one part of the approximal surface than another. The delicate strips will go into a very thin space and hug the surface like a glove, being coaxed to their places with any large end pusher, and with a curving motion, presuming, of course, the surfaces to have received the usual polishing preparatory to filling. The convexity that impinges against the adjoining tooth, combined

with the tempering effects of the hammer-taps in forming them, gives to them sufficient strength and stiffness to hold their place against the tooth perfectly. They are very firm and strong. For amalgam stoppings I leave them in place over night, and, upon taking them out the next day, have a shaped surface that is ideal.

I sometimes use them for gold stoppings, in which case the buccal and lingual edges, being somewhat free, allows them to give very slightly and produce the little overplus that we require for the final burnish condensation of edges, which is, of course, done at once, and finally finished before dam-removal. With the amalgam, however, this does not obtain, the edges being already solid. Indeed, in the latter case, having at the subsequent sitting taken away the little matrix, that slips out beautifully, there is usually nothing to do but to polish the perfectly convexed stopping, and it is finished.

I have here three or four teeth lashed together and partly invested, in a hurried endeavor to approximate the natural resiliency of the teeth in their sockets. A solid investment, not being the mouth condition, would show nothing of the delicate way in which the teeth in the mouth give to let in these tiny but powerful strips. I have filled one of the teeth with amalgam and taken out the matrix, leaving the filling untouched, merely turning the matrix to the opposite cavity in the same space (which, by the way, I should *always* leave to be filled until after one side was *finished*). It will be noticed that the cervical edge of that filling is absolutely perfect; there is no overplus to be removed, except the slight, usual one at the top near the grinding surface.

Dr. Elliott.—Does Dr. Hodson make a special matrix for each case?

Dr. Hodson.—I have a dozen or two on hand in order to save time, and can usually select from them, but it takes but a minute or two to make a new one, and so it is not of sufficient importance to worry me if I do not have one which answers the three essentials of (1) such size, bucco-lingually, as that it shall not be too long, and to keep its ends close to the tooth, that they may slip between the tooth and gum; (2) such width from grinding to cervical edge as that, upon being slipped over the cervical edge of the cavity, it shall not project above the grinding surface to be hit by the tooth in the other jaw; (3) such convexity as shall make it fit to its place perfectly "snug,"—no more, no less. The matrices come out, however, very easily, no matter how tight they go in; the delicate spring tightness of their adjustment, combined with the subsequent

filling, makes a slight wedging, so that they slip out with perfect ease by means of two little excavators placed in the holes made in the edges for that purpose, and with the curving motion mentioned in first placing them; and this very convexity holds them securely from falling out before the patient is again seen.

Dr. J. Morgan Howe.—Dentists are often asked, "What is good for the toothache?" and they find it a difficult question to answer. I have brought with me something to-night that is good for the toothache,—some little sample-bottles of a medicine I have found useful; I will give a short description of it, and ask the gentlemen to try it and give reports later on. I have had it in my medicine-case for some time, but have only lately been getting facts in regard to it. It is called mentho-phenol, and was produced by William Schaeffer, M.D. He published its composition and method of preparation in the *Boston Medical and Surgical Journal*, vol. cxxxiv. p. 111. It is obtained by adding one part of phenol crystals to three parts of menthol and melting the substances. It is a fluid, of pale amber color and aromatic odor, very pungent in taste, but is not a caustic. It dissolves readily in alcohol, ether, chloroform, and most oils, and is a solvent of iodoform and aristol. High antiseptic properties are claimed for it, while it undoubtedly possesses decided analgesic qualities. Dr. Schaeffer suggests a solution of two drops to an ounce of water as a mouth-wash. He has treated successfully, with a three-per-cent. aqueous solution, phagedenic chancroid ulcers, mucous patches of a syphilitic character, and erysipelatous suppuration of glands.

I made some of this a number of months ago, and have found it especially valuable in applications to aching pulps. A few days ago I had a very marked instance of its value, when, on opening a molar tooth that proved to be the cause of an abscess on account of the pulp being devitalized, the tooth began to ache violently when it was uncovered. As soon as the pulp-cavity was well opened, the pain in the tooth was very severe; the contents of the bulbous portion of the pulp-chamber was entirely putrid, and the dentine was saturated with the putrid material, so that it emitted a strong odor on drilling. I soon discovered that the pulp in two of the root-canals was living, and in the other it was dead to the apex, causing a large abscess. The portion of living pulp was so much irritated that it caused intense pain. Two or three applications of various medicaments were made to the exposed pulp-tissue without mitigating the pain in the least, but this mentho-phenol caused the pain to subside almost at once. There is no doubt that

it has wonderful analgesic properties. Whether it will be found beneficial in the dressing of root-canals, when the teeth are causing pain from pericemental inflammation, remains to be discovered.

Dr. Hodson.—What is Dr. Howe's treatment of just such conditions of partially destroyed pulps?

Dr. Howe.—My treatment would be to get the partially destroyed pulp out of the tooth as soon as possible; but if the patient is suffering very much, my first object is to allay the pain. Partially destroyed pulps are not always the active cause of great distress, and in such cases it is often possible to remove the portion that remains in the pulp-canal without special treatment.

Dr. Hodson.—I mean an upper third, for instance, of a pulp that is yet alive. How would Dr. Howe get rid of it?

Dr. Howe.—My purpose is to get it out of the root-canal as quickly as I can. If I can produce local anæsthesia to a sufficient extent to enable me to remove it, I do so at once.

Dr. Brockway.—If not, Dr. Howe would make an application of arsenical paste?

Dr. Howe.—Yes; I would use some arsenicated preparation that would destroy the vitality.

In the case I referred to the patient was so unnerved that I could not think of doing anything except relieve the pain; in other cases local anæsthesia can be effected so as to remove the remnant at once; and in still other conditions resort to devitalizers seems to be best.

Dr. Hodson.—Just this particular thing has been the most irritating point to me in all my practice,—what to do with the last third of those disreputable little pulps.

Dr. F. Milton Smith.—I have a little appliance that I would like to show. We had a paper at the last meeting by Dr. Brockway on cleaning teeth. Some of the gentlemen did not like the idea of using the engine-brush on the teeth in the mouth of more than one patient. I confess to a little prejudice on that score myself. I know of no way of cleansing one of those brushes after it has been used on teeth in a filthy condition that would satisfy me to have it used upon my own teeth at the next sitting. There have been little rubber cups made for this purpose. The last I heard, they were fifty cents a dozen, which made them rather expensive. I have here a little device which is not original. Dr. McNaughton had one at one of our meetings, but owing to his extreme diffidence he did not present it. I learned of it some years ago at the First District Dental Society. It is a mandrel made with a little shoulder

so that a bit of rubber tubing of the proper size will slip over the mandrel, the shoulder preventing the tubing from going too far. It is placed in the engine and a piece of coarse sand-paper used to give the tubing a knife-edge. The tubing costs very little and carries the polishing powders satisfactorily.

Dr. Stebbins then showed an apparatus for sterilizing instruments and explained the same.

Dr. R. O. Stebbins.—The boiler to this sterilizer is made from one piece of metal. The water should be poured into this boiler to about half an inch in depth. Instruments with the points up are placed in the rack or holder, which sets in the boiler, resting on the depression about one inch from the bottom. A small hole is made through the knob of the dome-shaped cover to allow the steam to escape. Steam is generated in one or two minutes by placing a lighted alcohol lamp or Bunsen burner under the boiler.

It is not only necessary to clean from the instruments visible filth, but to remove microscopic germs of disease that may be lurking on the instruments two or three inches from the points. When the instruments are thoroughly sterilized remove the rack. In a moment the heat of the instruments will dry them. Water may be heated in the cup attachment for use at the operating-chair. In the cover to the cup, which presents a concave surface, gutta-percha will remain soft for fifteen minutes, there being no outlets for the steam. This metal cover attached to the boiler makes the sterilizer applicable for surgeons' use.

The President.—Can a higher heat than 212° F. be obtained?

Dr. Stebbins.—Yes; if one stops the escape of steam through the hole in the cover he can get 240° or 250°.

Dr. S. E. Davenport.—I should like the privilege of presenting what Dr. J. N. Davenport, of Northampton, Massachusetts, calls the "poor man's crown." I suppose he means by that a crown constructed of inexpensive materials and requiring comparatively little of the operator's time to prepare it for insertion. The materials of which the finished crown is composed are an ordinary rubber, plain tooth, German-silver wire hammered into any shape that the opening in the root requires, and the ordinary vulcanizing rubber of any color decided upon. The *modus operandi* is very simple. The root-canal being first prepared, a plain, rubber tooth is selected and ground to the gum. The end of the root is ground fairly smooth, but one peculiarity about the method is that, if the palatine or lingual portion of the root stands rather high and is fairly strong, it is not necessary to cut it to the gum, as for most

other methods, it being possible to make the crown conform to any irregularity of the root. A piece of German-silver wire, of suitable size, is hammered on the anvil to the proper shape and fitted to the root-canal. The hammering gives additional stiffness, and makes the wire so rigid that there is no possibility of bending it with the ordinary force which comes upon a crown. One end of the German silver is then made jagged with the file and passed between the pins of the tooth, which are bent to hold it. Red, pink, or white vulcanizing rubber in small pieces is now packed upon the pins and over the wire with a warm instrument, and in sufficient quantity to form a shoulder which will cover the end of the root. This unfinished affair is then put into place, the pin going to its full extent into the root-canal, and the porcelain pressed to its proper position. Before it is put into place it is held over the spirit-lamp to soften the surface of the rubber, and the moistened thumb and finger will form the rubber by pressure accurately to the end of the root. It can be taken out, the surplus of soft rubber trimmed off, and put back again, half a dozen times, if necessary, within a few minutes, until everything seems right, when it is finally removed, invested in plaster in the flask, vulcanized, and finished. There are many ideas which can be applied to this method. It has been suggested by Dr. Davenport that wax instead of rubber could be used for the first fitting, particularly when two or three root-pins were to be used, and after everything was adjusted the waxed crown could be placed in the flask, the flask opened, the wax taken out, and rubber packed in. Then, too, bicuspids can easily be formed and made quite sightly by the use of white rubber for the inner cusp. These crowns should be secured to place with zinc phosphate.

Dr. Bogue.—Unless the gentlemen should want to put in just such a tooth as Dr. Davenport described, I would say that Dr. Herbst, of Bremen, showed me almost the same process, only, instead of rubber, he used tin as an attachment. He had his tooth ready to place in the mouth inside of half an hour. The wire for the pivot was placed in position, the cuspid tooth to be attached was placed in apposition, and attached to the wire with Stent's composition, which was then chilled with cold water from a syringe. The tooth and wire were then withdrawn, invested in plaster, and when that had set and been warmed pretty hot, tin was melted and poured in where the Stent had been. As soon as it was cold, it was filed down and polished, the tooth being set with phosphate.

Dr. V. Parker.—A few years ago, when I was at Little Falls, I

used to make a crown something like this, using amalgam scraps instead of rubber.

The President.—I have a little case here that I wish to explain before I pass it around. So far as I know, it illustrates something that is entirely new. In excavating the labial cavity of a cuspid tooth I found it impossible to locate the pulp-chamber. No broach would enter, and apparently the canal had disappeared. Continuing the excavation and pressing back the gum, I came upon a condition of affairs represented in this model. The pulp was ossified. That is common enough, of course, although in this case the patient was only about thirty years old; but I found that the decay, while it had attacked the normal dentine to a great extent, had not attacked the secondary dentine which had filled the pulp-chamber. If this fact has been heretofore noticed, I have no record of it; but it is plain and unmistakable in this case. I pointed out to Dr. Wilson at the time that the agents which had destroyed the dentine and enamel had failed to destroy the secondary dentine. I have no explanation to make, but I simply desire it to go on record.

The paper of the evening, entitled "Infection and Disinfectants," was then read by the author, Dr. Farquhar Ferguson.

The discussion was in part as follows:

The President.—We all know that in General Grant's case the epithelioma was supposed to have been produced by irritation from a tooth. In my own practice I have never met a case of that description.

Dr. Howe.—In regard to the question asked, I would say I have never seen a case of epithelioma that was unquestioned in its origin, as being due to the irritation of a tooth. I know the facts as stated by the President in regard to General Grant's case; but I have supposed that the idea that a tooth was a factor in irritating the tongue, and thus giving rise to the malignant process, was only a supposition.

If I may be allowed to continue, I would say a few words on the subject of the interesting presentation of infection and disinfectants that Dr. Ferguson has made for us. I consider it unfortunate that none of us, so far as I know, have been able to prepare specially to discuss this paper. I was impressed with the presentation of the dangers of infection, and the variety of means by which it can be brought about, so that the suggestion comes perhaps to most minds, what a wonder it is that we are any of us alive, with all these dangers coming at us in so many unavoid-

able ways! The probability is that we would not be alive, if it were not for certain antiseptic powers that we have within us that enable us to withstand and resist infection. In dealing with the subject of disinfectants or antiseptics, I was surprised that Dr. Ferguson did not refer to the idea that has been presented of late, that the serum of the blood contains a very powerful antiseptic. It has been said by Professor Vaughn, of Michigan University, that the antiseptic powers of the blood serum were far greater than that of bichloride of mercury. The relative value of disinfectants or antiseptics, in our experience, can hardly be disassociated from certain medicinal properties, and, in fact, I think I can divine in some expressions of Dr. Ferguson that he is a good deal of that opinion in regard to disinfectants generally; because he said he would rather trust to the experience and common sense of medical practitioners than he would to scientific investigation entirely. It seems to me that this is the point we must all fall back upon; that which in our experience combats the disease process, which results from introduction of pathogenic organisms, is not always the agent that has proved in the laboratory or in the test-tube to have the highest germicidal power. In fact, it may be an agent that has little or none of that power. Medicinal agents influencing the recuperative and resisting power of the tissues have a great deal to do with the question of the value of antiseptics. There seems little doubt that iodoform,—which I noticed was conspicuously absent from Dr. Ferguson's list—has very feeble antiseptic or disinfecting powers; but has nevertheless very valuable qualities, which aid living tissues to assist the action of pathogenic bacteria. This has been recently proved by Dr. Lomry, of Löwen University, in an interesting series of experiments on living animals. I do not feel competent to discuss off-hand the relative values of the different agents that Dr. Ferguson referred to; but I would call to mind some we have found valuable that he did not refer to, such as formaldehyde and electrozone. The latter is prepared as a proprietary article, and yet its chemical properties I think are pretty well known.

The President.—I have stopped using bichloride of mercury almost entirely. Some years ago, having a case of disease of the antrum, I began treating it with one-four-thousandth of the bichloride solution and reducing the strength finally to one-ten-thousandth. The case would not heal. I stopped using bichloride of mercury and used common salt, three per cent., with aseptic water, and the case got well rapidly. I also had another case of

disease of the antrum where I used bichloride of mercury without success, so that at the present time I do not use it, as I think it has an injurious effect on the soft tissue.

Dr. Bogue—The paper has delighted me and has shown me much that I did not know. It was in the hope that those doors that Dr. Ferguson has opened a little would be opened wider that I listened with all attention. There was one point that I hoped he would enlarge upon, and that was in regard to the infection of phosphorous necrosis. He intimated that through defective teeth infection might come from various causes. I was waiting to hear what position he would give the dental pulp, which necessarily, in the case of match-workers who suffer from necrosis, is exposed, or, having been exposed, is either hypertrophied or dead or superficially ulcerated. He spoke to us, to be sure, of the sentinels which are on guard, and of the attacking agents which are constantly presenting themselves, and I live in hopes that in his next talk he will take up not only infection but asepsis, and show us the difference between an antiseptic and an aseptic condition,—between a deodorizer and a preventive of decay. I hope he will bring up the question in regard to essential oils, which perhaps prevent the passage of bacteria because of their viscidity. Perhaps there is something more than that, but that idea came to me very forcibly.

Dr. Smith.—I am greatly delighted with Dr. Ferguson's paper. One of the points that specially impressed me was that he would rather accept the judgment of men who are familiar with the treatment and care of certain diseases than the bare experiments of the scientist. It is refreshing to hear one who is eminently qualified to deal with those things from a scientific stand-point give us that suggestion, for it seems to me oftentimes the idea is lost sight of, by our scientific friends, that the surroundings with which we work are not the same as they deal with. We know certain remedies will have certain effects, if they are surrounded by certain conditions, whereas, if the conditions are different, they have not those effects.

Another thought that occurred to me was in reference to the amount of heat considered necessary to destroy the different forms of bacteria. Boiling water is commonly thought sufficient to sterilize our instruments if we boil them long enough.

Dr. Howe.—In regard to essential oils, I think there is no question that some of them have very decided germicidal properties. Dr. Black has established that, and some medical writers have

referred to them. The oil of cinnamon, notably, I think, has been credited with very high germicidal powers.

Adjourned.

S. E. Davenport, D.D.S., M.D.S.,
Editor of The New York Institute of Stomatology.

ODONTOLOGICAL SOCIETY OF PENNSYLVANIA.

The regular meeting of the Society was held on February 13, 1897, the President, Dr. C. N. Peirce, in the chair.

The President.—We have with us this evening Dr. Henry Leffmann, who has kindly prepared a paper on "Ancient Metallurgy" for our instruction, and, if prepared, the Society will now receive it.

(For Dr. Leffmann's paper, see page 574.)

DISCUSSION.

Dr. Head.—Where they poured lead on the pipe,—was it pure lead or an alloy? Did it stop the water as a plug or as a solder?

Dr. Leffmann.—I think it was pure lead. They probably applied it with a blow-pipe.

Dr. Head.—Very much in the way of the other solder you spoke of?

Dr. Leffmann.—They sometimes applied a solder in that way and sometimes used a blow-pipe. The skilful workmen did fairly well, but the others did very bad work. Some of it was evidently done by persons of very little experience.

Dr. Peirce.—Dr. Leffmann, do you suppose that the disposition on the part of the ancients to make the higher metals out of the baser was believed to be a possible thing with the intelligent, or was it simply a trick to act upon the credulity of the ignorant?

Dr. Leffmann.—At no time among the ancients were correct notions on the nature of metallurgy prevalent. There was a confusion of ideas. They thought that all metals were from the same source. Lead was at one time thought to be the source of the other metals. This seems singular, but we can understand it when we reflect that lead ores frequently contain gold and silver. In cupelling lead we often get notable quantities of silver and a trace of gold. The ancients thought that the gold and silver were produced from the lead. They did not realize that gold and silver were

merely in the lead ore, therefore I think that the most educated persons were deceived on the subject. Even as late as 1630 the question was discussed as to why the calyces of lead and tin are heavier than the lead and tin themselves. There was confusion on this point because they did not understand that when lead oxidized it gained weight from the added oxygen.

As I mentioned in the latter part of the paper, I believe the preparation of alloys from absolutely pure metals—free from each other and from all other contaminations—will give rise to practical results. We must have some way of preparing them without oxidation, for instance, *in vacuo.* We have now positive knowledge that copper is affected by the presence of copper oxide in it. It has been long known that the presence of antimony will change the properties of gold.

There is here opportunity for painstaking research. Some of these errors of the past are prominent enough to show us how easy it is to go wrong. It was probably over-confidence that led these men astray.

Dr. Peirce.—Can Dr. Leffmann give us a little explanation of how it is that when we are melting metals together that tin melts at a low temperature and gold at a much higher, but putting them together they melt at a low temperature?

Dr. Leffmann.—The principle, I think, is both physical and chemical. In the first place, the melted tin conveys the heat to all parts of the gold. It is a close contact with the gold. Then, I think, there is a chemical combination. They enter into combination and make an alloy which is very fusible. The fusing-point of many an alloy is below that of its constituents. I think it is a sort of sugar-and-water action. The gold dissolves in the melted tin as sugar dissolves in water.

I made an experiment lately. I had often read that sodium and potassium, which are both solids, will make a liquid alloy. I tried the experiment, rubbing together a little of each. They promptly liquefied and remained so—the melting-point of the alloy being beneath that of both of the constituents, and below the temperature of the atmosphere. I think that the melting of the gold in the tin is due to a similar combination of the gold with the tin.

I once had such a combination illustrated in a peculiar way. I had some worn-out zinc plates of an electric battery, and wanted to melt the zinc plates to get the brass binding screws out. When I picked out one there was merely a shadow of it left,—the oxide and dirt. When I touched it, it fell to pieces. The brass had dis-

solved in the melted zinc. Now, there was a combination between the copper of the brass and the melted zinc.

In a bar of silver the copper alloy "segregates," as the assayer calls it, so that the lower part of the bar will not have the same amount as the upper part. One side of a silver dollar will sometimes assay differently from the other side, on account of the separation as the cooling of the ingot takes place.

Dr. Head.—When mercury dissolves metals and forms an amalgam that solidifies at the temperature of the air, would not that same phenomenon take place with tin or lead or zinc if the melting-point of those metals happened to be the normal temperature?

Dr. Leffmann.—I think so. The peculiarity in the case of mercury is simply due to the fact that we live at a temperature above the melting-point of mercury. If you experimented as much above the melting-point of zinc as we are above that of mercury, you would get the same series of results with zinc.

Dr. Warren.—I would like to ask Dr. Leffmann if the affinity between the gold and tin had something to do with the rapid melting?

Dr. Leffmann.—I think that the tin and gold are in different electrical states. The tin is a metal of high positive character, while the gold is a metal of low positive character, and therefore somewhat opposing conditions exist.

Dr. Head.—A curious chacteristic of amalgam lies in the fact that no matter how hard it sets, the mercury will leak out into another metal that is placed in contact with it. Would not that indicate a mechanical rather than a chemical combination?

Dr. Leffmann.—I think, perhaps, I must come back to the answer, "Both and neither." We have in most amalgams, as they are made, an excess of mercury. Now, that excess will readily go from one metal to the other. It does not follow that the combination is only a mechanical one.

I remember hearing a gentleman assert that there is lime in Portland cement, because we can wash lime out of it. That does not follow. The water may produce it from the elements present. I do not believe that the drawing out of the mercury is a proof of its presence in a free state. But I do think that there is mercury present in these amalgams in a free state.

Dr. Warren.—In any amalgam?

Dr. Leffmann.—Probably more than necessary to form the hard mass.

Dr. Head.—When metals are combined, does not the alloy almost always melt below the mean melting-point of all the contained metals?

Dr. Leffmann.—Yes. Because it is a chemical combination.

Dr. Head.—Why chemical?

Dr. Leffmann.—It is a new substance, and therefore governed by a new law.

Dr. Head.—But why does it not melt at a *higher* temperature?

Dr. Leffmann.—I do not think we can explain that. I think we can only say that proof of chemical combination is wanting.

Dr. Warren.—I would suggest that the difference lies in the fact that the *cohesion* between the molecules of the pure metal is greater than the *adhesion* between the molecules of the alloy. In other words, the affinity between molecules of a like nature is greater than between those of a dissimilar nature. Is not this a fact, Dr. Leffmann?

Dr. Leffmann.—Yes, I think so. But here again we have a difficulty in drawing the line between cohesion and adhesion. There are different degrees. Take a solution of starch in water. You can filter a dilute solution, and you cannot see any difference. Yet if you put in diastase, it changes the starch, because the diastase gets nearer to the water.

The ancients thought there were ferments for metals,—things to put into the base metals which would transform them into the superior, so that when they put them into the mixture all would turn into gold. It is very difficult to classify these terms,—chemical combination and mechanical combination, cohesion and adhesion.

Dr. Warren.—In regard to the alloys in the mint, where they find more of one of the constituents on one side than on the other, is not that due to the difference in specific gravity of these metals while in the state of fusion?

Dr. Leffmann.—Yes, I think it is. But it is not so much the difference of specific gravity between, for instance, copper and silver as between that of an association of copper and silver and the rest of the silver. There are two combinations formed. They are indifferently miscible with each other at the melting-point, but as they cool, one mass of copper-silver alloy fails to hold the other in solution, and thus we have not copper alone, but a richer or poorer copper-silver alloy. It is the separation of one combination from the other.

The same thing is supposed to exist in glass, which has been defined to be a supersaturated solution of one silicate in another. They are solid solutions, but they have the properties of solution.

While they are solutions in the hot state, the longer they are in cooling the more perfectly do they separate.

The character of iron can be changed by having it cooled more quickly or slowly.

Dr. Head.—I would like to ask the doctor how it is that if lead and zinc are mixed together, as sometimes happens in our dies, the lead does not seem to form any combination with the zinc. It invariably falls to the bottom. And yet in the case of bronze, there does not seem to be that tendency for the heavier metal to go to the bottom. Is it because in one case the chemical union is stronger than in the other?

Dr. Leffmann.—Mr. President, these very questions are interesting as tending to show how much remains to be done in this field. It shows that there are questions constantly asked that cannot be answered from our present knowledge. We will never answer these questions aright until we discard all the present knowledge,—consider all we know as wrong and, first ascertaining the purity of everything used, proceed so as to eliminate every possible error. The error produced by the atmosphere is a very serious one. The oxides of metals are soluble in the metals themselves.

Several years ago an aluminum amalgam was put on the market. It was copper, tin, and silver. Possibly there was aluminum in it, in the sense that a small quantity of aluminum was combined with it. By placing in one grain to a hundred one might get a better alloy, although it would consist of the same things.

An English observer made some interesting observations some years ago by using a powerful press. He proved that metals would combine under great pressure without melting. He placed some pieces of marble at the bottom, which, being lighter than the metals, would have gone to the top when the metals were melted. But the marble remained at the bottom, showing that at no time had the metals been fused. They were forced together by the pressure of many tons. Here is a method of making alloys without the injurious action of heat.

Dr. Warren.—Has that method been used with other metals except lead and tin?

Dr. Leffmann.—I think not.

Dr. Warren.—Is that aluminum alloy to which you referred now in the market?

Dr. Peirce.—Yes; and there is not any more aluminum in it. I have made alloys for many years. A very favorite alloy was twelve parts of silver, ten of tin, and five of gold. It is made by melting

the tin and placing the silver in in small pieces, and then the gold in small pieces. If we made it into an ingot, we found the ingot was not uniform. One side had more gold, and was harder than the other. We took the plan of having another crucible, and then poured from that right into the mould, and in that way secured it of more uniform quality throughout the ingot. It always required care to accomplish this. If that care was not exercised we had one side heavier than the other, or a different quality of material.

Dr. Head.—Would the doctor explain why steel gets harder when tempered?

Dr. Leffmann.—Steel gets larger when hardened. A steel rod that will pass easily in a ring when soft will not pass when hardened. There are several theories concerning tempering. I do not know what is the present theory among engineers. One is that the hardening causes the carbon to remain in the iron. There is no chance for the carbon, in solution, to escape. It is in the molecules of the iron, and is forced to remain. There is no perfectly demonstrated theory, however, as to the hardening of steel. There has been one suggestion, that the carbon remains because the steel is chilled so quickly that it does not have a chance to escape. By chilling it quickly it is actually forced to remain in its place.

Dr. Head.—That is a very interesting theory; and still more interesting in the light of the fact that if one should take a small steel wire and heat to a cherry-red, when it cools in the atmosphere, it will not get soft, the atmosphere cooling it so quickly that it still has some temper; while if that wire is heated to a cherry-red and then plunged into water, the moment it loses its red it is found to be soft. An old mechanic taught me this years ago. This fact is certainly incompatible with the theory spoken of by Dr. Leffmann.

INCIDENTS OF PRACTICE.

Dr. Peirce.—I have been using a solution of alum to prevent the accumulation of tartar; over a dozen patients have tried it, and I have been surprised at the excellent results. I tell them to take a glass of water with a pinch of alum in it, and rinse the mouth freely once a day. It is harmless to the teeth, and has kept the gums in good condition, where previously there was a heavy accumulation every month or six weeks. I wish the gentlemen present would experiment and report.

Dr. Head.—Have you used it in conjunction with pyorrhœa?

Dr. Peirce.—No; but it removes the accumulation of tartar, so there would be that much irritation removed.

Dr. Head.—Dr. Leffmann, perhaps you could tell us whether you would consider alum harmful to the tooth-structure?

Dr. Leffmann.—I do not think alum would produce any corrosion. Alum is not an active corrosive agent. I should therefore not expect much corrosion from the alum. If the quantity were large, it might have an astringent action on the gums. I feel that the experiment would probably show very little, if any, corrosion of the teeth proper. Alum is not like a free acid. It has the properties of an acid, but simply because there is a want of balance between the alumina and sulphuric acid. It shows the properties of an acid to litmus-paper and to our taste. But there is as much neutralizing material in it as in baking soda. We are apt to think that alum is an acid substance, when in reality it is merely a substance with an acid reaction.

Dr. Broomell.—Under the head of incidents of practice I have a case that I feel like reporting to the Society. It is a case of what might be called "bite interference." It is in the mouth of a young lady, twenty-six years of age. She has been under my care for at least twelve years, and I have suddenly noticed a change in her articulation,—such a change that the anterior teeth do not occlude by an eighth of an inch. Previously there was an over-bite of an eighth of an inch, the superior teeth overhanging the inferior. I examined the wisdom-teeth to see if it was the result of their entering the arch. That is not the cause. There is probably some change in the inferior maxilla itself. I would like to ask the members for an opinion as to the cause and the proper treatment of the case.

The President.—You do not think that the anterior teeth have been shortened by being thrown forward?

Dr. Head.—I judge we have all had patients who are in the ultimate stage Dr. Broomell speaks of. But I, for one, have not had the good fortune to see the process under development. Heretofore I thought that when the back teeth struck and the front teeth failed to join by an eighth of an inch or more, it was due to an excessive growth of the alveolus in the bicuspids or a lack of growth in the alveolus of the centrals. But from the cases I now remember, and there are three in my own practice, it would seem that it was from an excessive growth in the molars. I would be much pleased if a remedy could be found.

Dr. Broomell.—I cannot understand, Mr. President, how an excess of growth in the alveolus could effect this; because it is natural for the teeth to have opponents. I cannot understand it,

unless there is some change in the angle of the jaw. I have accused the young lady of a habit of extending her chin, resulting in a change in the convoloid process.

Dr. Head.—Still, it might also be due to the fact that this particular patient, while keeping the teeth apart, might give them a chance to come down, even in a short period. The difficult part to explain is why the front teeth should not do it as well as the back.

Adjourned.

JOSEPH HEAD, M.D., D.D.S.,
Editor Odontological Society of Pennsylvania.

NATIONAL ASSOCIATION OF DENTAL FACULTIES.

THE Fourteenth Annual Meeting of the National Association of Dental Faculties was held at the Hygeia Hotel, Old Point Comfort, Va., commencing Friday, July 30, 1897.

The following colleges of the Association were represented as noted below:

Alabama Dental College, Birmingham, Ala.—T. M. Allen.

University of California, Dental Department, San Francisco, Cal. —L. L. Dunbar.

Columbian University, Dental Department, Washington, D. C.— J. Hall Lewis.

Howard University, Dental Department, Washington, D. C.—A. J. Brown.

National University, Dental Department, Washington, D. C.—J. Roland Walton.

Atlanta Dental College, Atlanta, Ga.—William Crenshaw.

Dental Department of Southern Medical College, Atlanta, Ga.— S. W. Foster.

Chicago College of Dental Surgery, Chicago, Ill.—T. W. Brophy, Louis Ottofy.

Northwestern University Dental School, Chicago, Ill.—Theo. Menges.

State University of Iowa, Dental Department, Iowa City, Iowa.— W. S. Hosford.

Louisville College of Dentistry, Louisville, Ky.—H. B. Tileston.

Baltimore College of Dental Surgery, Baltimore, Md.—M. W. Foster.

University of Maryland, Dental Department, Baltimore, Md.—F. J. S. Gorgas.

Boston Dental College, Boston, Mass.—J. A. Follett.

Harvard University, Dental Department.—Thos. Fillebrown.

Dental College of the University of Michigan, Ann Arbor, Mich.—J. Taft.

University of Minnesota, Dental Department, Minneapolis, Minn.—W. P. Dickinson.

Kansas City Dental College, Kansas City, Mo.—J. D. Patterson.

Western Dental College, Kansas City, Mo.—D. J. McMillen.

Marion-Sims College of Medicine, Dental Department, St. Louis, Mo.—J. H. Kennerly.

Missouri Dental College, St. Louis, Mo.—A. H. Fuller.

University of Buffalo, Dental Department, Buffalo, N. Y.—W. C. Barrett.

New York College of Dentistry, New York City.—F. D. Weisse, J. Bond Littig.

Cincinnati College of Dental Surgery, Cincinnati, Ohio.—G. S. Junkermann.

Ohio College of Dental Surgery, Cincinnati, Ohio.—H. A. Smith.

Western Reserve University, Dental Department, Cleveland, Ohio.—George H. Wilson.

Pennsylvania College of Dental Surgery, Philadelphia, Pa.—C. N. Peirce.

Philadelphia Dental College, Philadelphia, Pa.—S. H. Guilford, Leo Greenbaum.

University of Pennsylvania, Dental Department, Philadelphia, Pa.—James Truman.

Tennessee Medical College, Dental Department, Knoxville, Tenn.—R. N. Kesterson.

Central Tennessee College, Meharry Medical Department, School of Dentistry, Nashville, Tenn.—G. W. Hubbard.

University of Tennessee, Dental Department, Nashville, Tenn.—J. P. Gray, L. G. Noel.

Vanderbilt University, Dental Department, Nashville, Tenn.—H. W. Morgan.

University College of Medicine, Dental Department, Richmond, Va.—L. M. Cowardin.

Royal College of Dental Surgeons, Toronto, Canada.—W. E. Willmott.

The following colleges were elected to membership:

Milwaukee Medical College, Dental Department, Milwaukee, Wis., represented by Reinhold E. Maercklein.

Tacoma Dental College, Tacoma, Wash., the constitution being signed by proxy by Dr. Kennerly.

New York Dental School, New York City, represented by John I. Hart.

Ohio Medical University, Dental Department, Columbus, Ohio, represented by J. F. Baldwin.

Baltimore Medical College, Dental Department, Baltimore, Md., represented by J. W. Smith and William A. Montell.

The application for membership of the University of Omaha, Dental Department, was laid over till next year, at the request of its officers.

Applications for membership were reported by the Executive Committee from the Pittsburg Dental College, Pittsburg, Pa.; Dental Department of the College of Physicians and Surgeons, San Francisco, Cal.; Colorado School of Dentistry, Denver, Col.

The following report laid over from last year was adopted:

"Your committee on choosing a color respectfully report that they have decided to recommend the standard lilac as the distinctive dental color, and they recommend the adoption of the academic costume according to the requirements observed by the intercollegiate system."

The resolutions laid over from last year, making the annual college term seven full months, and recommending that the annual meetings be held in connection with the National School of Dental Technics, and at a time of the year when the colleges are in session, were negatived.

A committee, consisting of Drs. Henry W. Morgan, M. W. Foster, Theo. Menges, C. N. Peirce, and H. A. Smith, was appointed to meet a similar committee from the National Association of Dental Examiners, for the purpose of harmonizing the differences of opinion between the two associations. This committed reported rules which had been agreed upon by the two committees.

The report was discussed at length and again referred to the committee, which later reported, through the Executive Committee, a resolution, which was adopted, providing for the codifying and arranging of the existing rules of the Association, and the preparation of such additional rules as may be deemed advantageous to both organizations in advancing the standard of dental

education in the United States. On motion, the committee which had had the matter in charge in the conference was continued for this purpose.

A communication from the Dental Department of the State University of Iowa was received, asking consent of the Association to its conferring the honorary degree on Dr. F. P. Weber, of Cherokee, Iowa. The request was declined on the ground that it is contrary to the practice of the Association.

A similar communication from the University College of Medicine, Dental Department, Richmond, Va., asking the privilege of conferring the *ad eundum* degree on Dr. Thomas G. Cowardin, of London, Eng., was refused upon the same grounds.

The rule regarding preliminary qualifications adopted in 1896 was declared to have been adopted in an unconstitutional manner, and was therefore rescinded. The following was adopted in its place, and by unanimous consent was ordered to go into effect at once:

Resolved, That the minimum preliminary education requirement of a college of this Association shall be a certificate of entrance to the first year of a high school or—in States that have no high school—of graduation from a grammar school, or its equivalent, to be determined by an examination.

Resolved, That nothing in the above shall be construed to interfere with colleges of this Association that are able to maintain a higher standard of preliminary education.

A communication was read from Dr. W. Mitchell, president of the American Dental Club of London, requesting the appointment of a committee to co-operate with a similar committee in Europe for the purpose of securing just recognition of the diplomas issued by the colleges belonging to the Association. The communication was favorably considered, and the president appointed as the committee, Drs. W. C. Barrett, D. J. McMillen, S. H. Guilford, A. H. Fuller, and Faneuil D. Weisse.

The *Ad Interim* Committee reported that one new question decided by them during the year was that a student who was in arrears for fees could not be accepted by another college if objection was made by the college to which he was indebted. This ruling was sustained by vote of the Association.

The committee also recommended that steps be taken to secure definite knowledge as to the curricula and requirements of foreign colleges, so that the members of the Association should be able to decide upon the standing of students coming from them. Referred

to the committee appointed to consider the matter of Dr. Mitchell's letter.

A paper prepared by Dr. W. C. Barrett, Buffalo, N. Y., at the request of the Executive Committee, and entitled "The Study of Anatomy," was read by its author.

(For Dr. Barrett's paper, see page 581.)

The paper was, on motion, directed to be incorporated in the official report and copies sent to the journals for publication.

A committee, consisting of Drs. S. H. Guilford, Theo. Menges, and M. W. Foster, was appointed to select persons to prepare papers on subjects connected with the work of the Association, to be read before the next meeting.

Dr. Barrett offered the following, which was adopted:

Resolved, That the final vote upon the admission of a college to this Association shall not hereafter be taken unless a duly certified and qualified delegate is in attendance.

The following resolution, offered by Dr. L. L. Dunbar, was adopted:

Resolved, That in order to maintain a reputable standing in this Association, no college under its jurisdiction shall permit any member of its faculty or teaching staff, board of trustees, or stockholders to serve in a judicial capacity as a member of a State Board of Examiners.

Dr. Taft offered the following, which was adopted:

Resolved, That a committee of three on curriculum be appointed, whose duty it shall be to compare the schemes of study of the various dental colleges, with the view of harmonizing these schemes and making them as nearly alike as practicable, to report next year.

The Committee on Text-Books recommended the following:

Essig's "American Text-Book of Prosthetic Dentistry."

Hodgen's "Dental Metallurgy."

Schafer's "Essentials of Histology," fourth edition.

Abbott's "Principles of Bacteriology," third edition.

Gray's "Anatomy," last edition.

Luff's "Manual of Chemistry."

Burchard's "Compend of Dental Pathology and Therapeutics."

The report was adopted, and the committee was instructed to examine Kirk's "American Text-Book of Operative Dentistry,"

and Marshall's "Injuries and Surgical Diseases of the Face, Mouth, and Jaws," and forward their views at the earliest possible moment to the secretary, in order that they may be incorporated in the printed Transactions.

A committee, consisting of Drs. M. W. Foster, William Crenshaw, and L. G. Noel, reported appreciative resolutions on the death of Drs. Frank Abbott and Francis Peabody, late members, who have died since the last meeting was held. The resolutions were adopted.

The following lie over for final action till next year:

Offered by Dr. H. W. Morgan, seconded by Dr. H. B. Tileston:

Resolved, That on and after the session of 1899–1900, the regular sessions of each college belonging to this Association shall be extended to four years.

Dr. J. Taft moved to amend the constitution to require applications for membership to be sent to the secretary of the Executive Committee instead of to the secretary of the Association.

Offered by Dr. T. Fillebrown:

Resolved, That no college connected with this Association shall confer any degree as honorary which is usually granted in due course of study and examination. All former rules on the subject are hereby repealed.

Offered by Dr. Barrett:

Resolved, That after the regular session of 1898–99 the annual college term for the members of the Association shall be seven full months.

Dr. Crenshaw moved to strike out Rule 3 and adopt the following instead:

Resolved, That the time in which students can enter schools of this Association shall be the first ten days of the session of the school, dating from the time announced in its catalogue.

The following were elected officers for the ensuing year: T. W. Brophy, Chicago, President; D. J. McMillen, Kansas City, Mo., Vice-President; J. H. Kennerly, St. Louis, Mo., Secretary; H. W. Morgan, Nashville, Tenn., Treasurer.

Executive Committee.—J. Taft, Cincinnati; Thomas Fillebrown, Boston, Mass.; B. Holly Smith, Baltimore, Md.

Ad Interim Committee.—James Truman, Philadelphia; F. J. S. Gorgas, Baltimore; J. Hall Lewis, Washington, D. C.

The newly elected president, on being installed, announced the following appointments:

Committee on Schools.—J. A. Follett, Boston, Mass.; H. A. Smith, Cincinnati, Ohio; L. L. Dunbar, San Francisco, Cal.; J. D. Patterson, Kansas City, Mo.; W. T. McLean, Cincinnati, Ohio.

Committee on Text-Books.—S. H. Guilford, Philadelphia, Pa.; William Crenshaw, Atlanta, Ga.; W. C. Barrett, Buffalo, N. Y.; W. P. Dickinson, Minneapolis, Minn.; Faneuil D. Weisse, New York City.

Committee to select Subjects and Essayists for Next Meeting.—J. Taft, Cincinnati, Ohio; Edward C. Kirk, Philadelphia, Pa.; A. H. Fuller, St. Louis, Mo.

Adjourned to meet at the call of the Executive Committee.

Editorial.

OLD POINT COMFORT.

The meeting of the American Dental Association at Old Point Comfort was anticipated with mingled feelings of hope and anxiety. When the sessions closed in 1896 at Saratoga Springs, the hope was expressed that the meeting in 1897 would result in a union of all the professional elements—North, East, South, and West—in an organization which should truly represent the national feeling in the various sections of the country. This hope grew, as the year passed away, into a conviction that this could be accomplished, notwithstanding much opposition expressed in certain quarters.

The two conventions, the American and the Southern, met separately at Old Point Comfort, the one at the Chamberlain and the other at the Hygeia. The Joint Committee of both bodies had, during the year preceding, prepared a course of action for both organizations, thus preventing delay and, perhaps, much friction.

The work of both Associations proceeded as usual; that of the American was excellent in a scientific sense, suffering but little from the overshadowing influence of reorganization, which seemed to occupy all minds.

The exhibit of the Ward's Natural Science Establishment of Rochester, N. Y., under the care of Mr. Charles H. Ward, was not only novel, as far as the American Dental Association was concerned, but was one, probably, never before brought together at a convention, or anywhere else. The time was too short, unfortu-

nately, to give it that study that its great merits warranted; and it is to be hoped that it will in the future find a resting place in some one of our large educational institutions. The specimens consisted of jaws, crania, dentitions, and single teeth, fossil and recent, some of which were prepared in sections, and it embraced all the classes and order with many of the individual species of the vertebrates.

The lantern exhibit of Dr. I. N. Broomell was one of unusual interest, covering entirely new ground in the development of the teeth, in that it gave the macroscopical appearances of that process from the earliest period to the development of the first permanent molar. The dissections made showing the beginnings of the development of enamel and dentine were not only unique in character, but original in conception and execution.

Owing to important duties, the writer was unable to attend any of the sessions of the Southern Dental Association, but it is inferred from reports to have been equally satisfactory.

Both organizations, by a unanimous vote, concluded to meet in joint convention to complete a new organization. The Southern had decided it was not wise to abandon entirely the old organization, but that this should be continued as one of the branches of the national body. The members of the American, on the other hand, decided to abandon the Association and wind up its affairs. This was not accomplished without opposition, for it was felt by many that it would be better to continue it as the Eastern branch. It was further contended that it was impolitic, at this juncture, to dissolve this organization until the new one had gained a secure place in the interest of the profession. The majority controlled, and the American Dental Association ceased to exist on Friday, the 6th of August, 1897, at 12.30 P.M. The balance of the money in the treasury, after settling all indebtedness, was voted to the treasury of the Dental Protective Association, and the proceedings of many years, in the care of the secretary, were donated to the Army and Navy Medical Museum at Washington, D. C.

The final hour was one long to be remembered by those present. The American Dental Association had been a power in the dental profession for thirty-seven years. Its work had been, at times, unsatisfactory, but a true reading of its history will give to it a large share of the credit of whatever advance has been made in dental work during the period named. The remarks of the various speakers appropriately voiced this feeling, and they mourned the necessity of destroying this body that something more in accordance with changing circumstances might live.

The joint convention met at the Hygeia Hotel, Dr. Rich, of Washington, D. C., presiding. In a very brief period a constitution was adopted and a name given to the new organization, that of "The National Dental Association." This was so rapidly accomplished that those present were given but limited time to consider the main question before it was adopted. Then it was recalled that the laws prepared for its government had not even been read, although published in pamphlet form. The reading finally took place, but resulted in no change, and the convention entered into the election of officers, resulting in the choice of Dr. Thomas Fillebrown, of Boston, as president for the ensuing year. The other officers were divided between the two original associations. That this organization could be accomplished without friction was not expected, but through the skilful management of the Joint Committee there was no opposition manifested until an effort was made to change the name from that selected to one more definite. The discussion aroused some feeling, but it was finally left unchanged, the matter going over to the next session of this body, to be held at Omaha, Neb., in 1898.

This, in brief, is the history of the hour; for a more detailed account readers are referred to the report to be published in this journal.

The question which concerns all dentists of the United States is, What is to be the outcome of the change? Time alone can answer this; but it is quite apparent that the element of permanency does not appear to exist in the laws prepared for its government. These are decidedly overweighted, and it will be exceedingly difficult to govern under them. It is imagined the first business next year will be an effort to eliminate at least one-third of this organic law, for this amount might well be set aside without injury. The difficulties met with by the committee are fully appreciated, and the necessity understood for a speedy adoption of this instrument to avoid protracted discussion; but it must be regarded as hasty legislation, and this invariably means subsequent regret. The proper course, in the judgment of the writer, would have been to have made a short constitution and an equally brief series of by-laws, and, these adopted, the accretions could safely be left for experience to develop.

The period fixed for the annual meeting is a very questionable change. It will be practically impossible for dentists of the Eastern cities to meet at the time proposed. September means to a majority of these resumption of practice at the close of a protracted holiday,

and they will view with little favor an extension to make a lengthy journey before recommencing professional labor. It is very possible that other sections may find this a convenient period, and it is anticipated that the first meeting at Omaha will have a large Western attendance, but, for the reason given, not many from Eastern sections.

The writer of this was an enthusiastic advocate of the union of the two principal associations of dentists in North America. It was, in his opinion, a waste of energy to distribute and weaken effort by the methods previously adopted. Hence this meeting was looked forward to as the opening of a new era in dentistry, in which some of the effete old would be eliminated and changes appropriate to the present period be installed as part of the new organization. That the majority clung tenaciously to the old was in accordance with the conservative feeling always present and not easily overcome; but it is, nevertheless, a great disappointment that the organic law contains not a single new feature. It fails to provide for the future; hence, in accordance with all past experience, it will not meet the demands of the coming generations.

The writer of this gave in his opening address the changes which, in his opinion, were necessary for the fuller development of the dental profession in this country, but none of these suggestions were considered of sufficient importance to be engrafted upon the organic law, and it is hopeless to expect these, either in whole or in part, will be adopted in the near future. One suggestion, it would seem, might have been consistently incorporated, that of providing a fund to assist in the investigation of unsolved problems.

In view of all the facts connected with this union meeting, it must sadly be acknowledged that not one step in advance has been made. The American Dental Association has passed into history and in its place a nominal union of the South with the North. It is to be hoped that the next meeting will make this a reality, but until this is accomplished we must regard the situation as entirely temporary and with nothing absolutely settled.

THE ANTAGONISM OF LAW.

The ill-judged proceedings of some connected with the administration of dental laws has created a wide-spread feeling of disquiet in college circles, and has led, in repeated instances, to open antagonism. This is to be deplored, for it necessarily unsettles edu-

cational processes and creates inharmony where unity of sentiment and action should alone prevail.

The National Association of Dental Faculties has, throughout this trying period in dental education, aimed to conserve all interests, and has honestly endeavored to establish fraternal relations with the National Association of Dental Examiners, in the hope that time would eventually quiet all disturbing elements and permit the two bodies to work together for the advancement of educational methods. With this idea a joint committee was proposed by this body, at its recent meeting at Old Point Comfort, the purpose of which was to propose a plan for the settlement of all differences and arrange a basis of work upon which both Associations could rest. This proposition was acceded to by the National Association of Dental Examiners, and the two committees met in joint session. The indications, at first, all pointed to a harmonious settlement, and the general feeling, on the part of the members of the National Association of Dental Faculties, was one of gratification that they had heard the last of these criminations and recriminations, so frequent of recent years.

This peaceful state of things was, it seems, altogether illusory, for at the very last hour of the session of the Examiners there was adopted a series of rules which reaffirmed all the objectionable features previously formulated by the committee on schools of that body. This document was not sent officially to the National Association of Dental Faculties, hence criticism, in detail, is deferred until the report of proceedings is at hand; but as there is no question as to the fact that such rules were adopted and subsequently read at the final meeting of the Faculties, it is not improper to state here that this attempt to control the curriculum of each of the dental colleges of this country will be resisted and treated with the contempt it deserves, and, further, that the threat which is supposed to give force to the rules that colleges refusing to submit will be severely dealt with (the substance not the words being given) will utterly fail of its hoped-for effect, for should any State board attempt to carry this rule into effect, it would very speedily find itself outside of the pale of the law and could legally accomplish nothing.

The claim has been made that the National Association of Dental Examiners has been working solely for the good of the dental profession, and it is freely and gratefully acknowledged that with many active therein this is true, but this cannot be said of all. The action of some in antagonizing colleges and holding them up to unjust ridicule, evidences the fact that the spirit manifested is

not one leading to harmony, but to that of injury, if not to the eventual destruction of all dental laws in the United States.

The action of this National Association of Dental Examiners, being without legal force and without the concurrence of the entire number of State boards, must fail in the effect desired, and it is to be hoped that the dental colleges of the country will quietly continue their work regardless of this action, leaving the question to be settled, if settled at all, by the higher courts.

Bibliography.

THE AMERICAN TEXT-BOOK OF OPERATIVE DENTISTRY. IN CONTRIBUTIONS BY EMINENT AUTHORITIES. Edited by Edward C. Kirk, D.D.S., Professor of Clinical Dentistry in the University of Pennsylvania, Philadelphia. Editor of the *Dental Cosmos.* Illustrated with seven hundred and fifty-one engravings. Philadelphia and New York: Lea Brothers & Co., 1897.

A work on operative dentistry, covering all the modern phases of that branch of stomatology, has been for a long period a necessity, and it is a gratification that the liberality of the publishers, Lea Brothers & Co., has given to the dental profession, in the past year, two companion volumes, each, in its place, unequalled for careful and generally thorough treatment of the subjects supposed to specially belong to the two branches of practical dental work.

Both of these works have been given an encyclopædic character, a necessity where a number have written upon quite distinct subjects. This method of treating special branches of work has a good and a bad side. It loses, ordinarily, in that compact and steady advance from the simple to the complex, possible with the individual writer, and gains, or should gain, in a broader and more thorough consideration of subjects. While this is true, it still remains the fact that, after all, the matter resolves itself into individual opinions, resulting frequently in confusion through antagonistic ideas.

The present volume has overcome this, in a large degree, through very careful editing, and the editor, Dr. Kirk, is to be congratulated that he has been able to systematize this, and avoid the difficulty to a great extent. The amount of labor this has required cannot be appreciated except by those forced to do similar work;

but it is certainly not the least of that given to the preparation of the volume.

The contributors are names well-known in dentistry,—Thompson, Andrews, Burchard, Case, Christensen, Clapp, Cryer, Darby, Goddard, Guilford, Jack, Ottofy, Peirce, and Thomas. These with the editor, Dr. E. C. Kirk, constitute a corps capable of doing justice to the subjects treated.

It would be unreasonable to expect that the views expressed will meet with universal concurrence, indeed, it may be expected that some of them will receive sharp criticism. The profession of dentistry is largely individualized, and this manifests itself in dogmatic assertion and very positive beliefs and more positive practice.

The book opens with a chapter on the "Macroscopic Anatomy of the Human Teeth," by Alton Howard Thompson, D.D.S. This is prepared in the writer's usual excellent style, and with that exact knowledge for which he is so widely known, and which is so universally appreciated.

"The Embryology and Histology of the Dental Tissues," by R. R. Andrews, A.M., D.D.S., F.R.M.S., is a masterly treatment of the subject, and very beautifully illustrated. The illustrations throughout the book are worthy of special notice, for these are not only, in the main, original productions, but they mark a dividing line between the old and the modern methods of preparing books of this character. Dr. Andrews gives the subject as it presents to the eye of the microscopist, and not, as formerly, drawings in which the personal equation largely prevails.

It is not the purpose of this review to follow individual contributors, for each has given, in his own way, his special thought and practice, but rather to follow the work as a whole, for it is in this success or failure must result either as a text-book or as a work of reference.

The difficulty has, doubtless, been experienced by the editor in defining exactly what is meant by operative dentistry. This term originated in the earlier work of the profession to distinguish the labor over the chair from that in the laboratory. The editor says, in his preface, "In determining the range of topics which may be properly classified as coming within the field of operative dentistry, the editor has been guided by the principle of distinguishing all those procedures the performance of which includes operative work upon the mouth as belonging to operative, and all those which are performed in the laboratory as pertaining to prosthetic dentistry." This would seem a reasonable definition, but as all

the operations in the laboratory are merely preliminary to operations in the mouth, renders it difficult to make any sharp line of division. The result of this definition of the editor has been to exclude all crown- and bridge-work, or any of the forms of artificial substitutes, splints for fractures, or obturators. This is, doubtless, the correct course to pursue with this volume, as a companion to that previously issued, but, viewed as a distinct contribution to operative dentistry, it is open to criticism.

The principal object to be secured in a work of this kind is absolute simplicity of treatment. To effect this all subjects should, in the opinion of the reviewer, be treated upon the methods adopted by the true teacher, that of making everything clear to the dullest member of the class; the brilliant scholar can always take care of himself.

The shaping of cavities so that the beginner will find no difficulty in gaining support for his filling, as well as retaining the first piece of gold, is the most important of the entire operations of filling teeth. The mere packing of gold is a very trifling matter of mechanical skill. All teachers have found that the average student fails at the very first move, if he fails at all, and that is in not being able to recognize the necessity of a mechanical retention-place for the first piece of gold. The instructions upon the preparation of cavities, while in the main correct and lucid in explanation, fail, in the judgment of the reviewer, in not being clear upon this one vital point. *The student must be taught to anchor solidly his first piece of gold;* but the writer of this chapter does not, apparently, regard this of much importance, or, at least, does not specially dwell upon it.

The pathological relations of various operations in the mouth are of first importance, and cannot be separated from the mere mechanical side of the labor involved. In some of the chapters this is carefully looked after, in others, not to the extent of training the beginner to processes essential to his own success or the good of his patient. This defect is noticeable in the chapter on the rubber dam. There is, probably, no appliance that has caused more gingivitis than this valuable aid to dental operations. In itself it is, in degree, harmless; but when the accessories are placed in position, clamps and ligatures, the result is irritation and frequently severe inflammation at the gingival border after a prolonged operation. Now, this means, when the dam is removed, a wounded gum tissue, and frequently an irritated pericementum. It is a truism in pathology to assert that with this condition in the mouth there is established an excellent culture medium for pathogenic

germs, and they are never slow to take advantage of the opportunity. In fact, in careless hands, in forty-eight hours their development will be manifested, where injury has resulted, as described, in acute pericementitis or the incipient stages of pyorrhœa. It seems to the reviewer that it would have been well to raise the danger signal here and have given good advice as to supplementary antiseptic measures to prevent pathological sequelæ. These criticisms apply with equal force to the use of the wedge. This is very useful in filling, properly used, but a very dangerous one in inexperienced hands, and this, it would seem, should have been stated.

Would it not have been better in writing, "That all metals become more or less stiff or rigid by hammering, but become soft again by the application of considerable heat," to give the reason for this change? The mere statement of fact does not carry with it the intelligence needed to be absorbed by the student. An error of not much moment is noticed in describing the placing of the dam where decay has extended beneath the gum margin, and a Mack screw is recommended "to be inserted two or three threads into *the dentine*." It is presumed the writer meant the cementum, for two or three threads of those fine screws would fail to penetrate the dentine at the cervical border.

With the exception of this allusion to the use of the screw, the reviewer fails to find any mention of these valuable aids in cavities of exceptional difficulty. Surely screws have not been relegated to the museum of antiquated appliances? In the opinion of the reviewer they not only retain a place, but a very valuable place, in operative dentistry, and should have been given their proper value in a work of this kind.

In the article on devitalization of the pulp, the author fails to make clear the importance of a previous condition of active congestion of the pulp prior to the use of arsenic. While recognizing this as antagonistic to the action of the agent, he seems not to make the fact clear that it is possible to destroy a pulp, even when actively congested, by the use of proper anæsthetics in connection with the devitalizing agent, and recommends as a primary operation the reduction of "the state of hyperæsthesia of the pulp and to relieve the congestion . . . before commencing the devitalization." This is the old method, but by the use of iodoform or cocaine this has been rendered unnecessary. In this connection it is stated that "iodoform has been much used in combination with arsenous acid in the devitalization of the pulp; its value depends upon its *disinfecting power*." As the reviewer was the originator of the idea of

the use of iodoform in combination with arsenous oxide, it can be stated that its introduction was not based on its *antiseptic* property, which is almost valueless, but upon its *anæsthetic effect*, recognized the world over as being superior to any other agent, not excepting chloroform, and having the advantage over the latter that its action is continuous. Its use in combination with arsenous oxide was recommended because of this property of continually acting as a powerful sedative, lowering the tone of the local nerves, thus limiting the blood-current and reducing the hyperæsthetic state, and enabling the arsenic to enter the tissue by imbibition, and have its legitimate effect in paralyzing the nerve-supply and cutting off nutrition. This, when applied according to directions originally given, resulted in a painless devitalization of congested pulps. The same, in degree, occurs with cocaine. It is true, the author has given a formula of arsenous acid and cocaine, but it does not seem to have been used for the purpose described.

There does not appear to have been any attempt made to regulate the amount of arsenic to be used. This is impossible with the formula given or by the old one of Dr. J. D. White, of arsenic, morphine, and creosote. The teaching of the present time is to avoid all such combinations and to use the ingredients in exact proportions at the time these may be required. The old method is certainly empirical, as any definite quantity is out of the question, and this is of vital importance in dealing with an agent as destructive as arsenic. It seems that the student should be taught the nearest approximate amount of arsenic required to devitalize the pulp to the *upper third* of a single-rooted tooth. This understood, increased amounts can be applied in the trifurcated teeth with intelligence.

It would have been well to have thrown out a caution as to its use and the danger of producing serious sloughing, and the means to be resorted to in case arsenic should inadvertently be taken up by the gum tissue, an accident by no means uncommon, especially with beginners.

The value of the "diagrammatic representation of the serial decomposition of an infected pulp," on page 320, may be seriously questioned. To be of any value these imaginary drawings should be based on repeated observations, and even then they may be misleading. It is very doubtful whether the diagram in question gives a correct idea of the progress of destruction of the pulp. Indeed, it is not in accord with the recognized progress of inflammation, as the place of formation of pus is given at the apical foramen, when, pathologically considered, pus should have no

specially defined limitations in an inflamed pulp, but should be and is invariably found distributed in various parts of that issue. It is not thought that this adds materially to this otherwise carefully prepared chapter.

The assertion that Maynard was the first to fill canals needs qualification. He has been generally credited with this, but there is evidence to prove that Hudson filled pulp-canals long anterior to the time of Maynard.

The treatment given for pericementitis is by no means satisfactory. There is no proper division made between pericementitis, temporary or chronic, or where it shades off into the acute form, and some of the treatment seems to the reviewer impracticable, if not injurious. The writer of the chapter is recommended to study up Arkoöys's classification of this pathological condition, for while he may not learn much in treatment, it will give ideas as to the systematic arrangement for study or for teaching. In the interest of truth, it must be said of this portion of the work that it fails in the most important essential of treatment, practical value, inasmuch as some of the proposed methods would tend to increase rather than palliate the symptoms.

It is difficult to understand this quotation from the "Clinical History of Acute Alveolar Abscess:" "In from twenty-four to forty-eight hours a spot of fluctuation makes its appearance at the summit of the swelling; the spot becomes yellow and soon opens, affording escape to the abscess contents." The progress of abscess varies with the class of teeth affected and the density of the alveolus, the duration ranging from twenty-four hours in the lateral incisors to a week in the inferior molars, but no hard-and-fast limitations can ever be made in the period of duration of this pathological condition.

The chapter on "Pyorrhœa Alveolaris" is well prepared, and is an excellent statement of the views held by the author, but will, probably, not be accepted by many readers as the final word upon the subject. Much space is given to the views entertained by those who regard pyorrhœa as "directly dependent on the deposition of the uric acid, urates, and calcium salts in the pericemental membrane," and of those the author furnishes the best and most brilliant example. It seems to the reviewer that, while a brief allusion to these views was certainly necessary and desirable, it would have been better to curtail theory, and in its place give more space to practical methods of treatment.

The chapter on "Discolored Teeth and their Treatment," by

the editor, is a marked evidence of the intelligent growth of processes for overcoming this difficulty in practice. For more than twenty years after the writer of this review introduced his method of bleaching it was met by a coldness bordering on contempt, but now bleaching is regarded rightfully as being one of the most important procedures in operative dentistry. While the more recent methods have a value, possibly, far above those first introduced, the important fact is emphasized in this chapter that teeth by all the processes described have been bleached, and teeth rendered presentable that were, under the old let-alone policy, a continued disfigurement and a disgrace to dentistry as a profession. This chapter must be regarded as of great practical value.

The chapter on "Extraction of Teeth" is a well-prepared article, and profusely and intelligently illustrated, in this respect far in advance of any within the knowledge of the writer.

The practical side of the "Extraction of Teeth under Nitrous Oxide Anæsthesia" is given by a well-known specialist, and is therefore the product of long, practical experience, and must be of special value to students.

Space does not permit the reviewer to follow the remaining chapters with anything like a critical examination. These are "Local Anæsthetics and Tooth Extraction," "Plantation of Teeth," "Management of the Deciduous Teeth," "Orthodontia Exclusively as an Operative Procedure," and "The Development of Æsthetic Facial Contours." All of these are treated exhaustively and with the recognized ability of the authors.

The exceptions taken to some things in this volume are not made in a spirit of hypercriticism, but with the hope that future editions will correct defects, and that, in time, the dental profession will have a purely practical work on operative dentistry, eliminating as much as possible personal predilections. This book has less of this than might have been expected, but there is room for improvement. There has been a notable effort to make it a volume worthy of the confidence of the dental profession, and whether the general judgment will recognize it as authority or simply as a book of reference, it must be regarded as the best attempt made in this country or elsewhere to originate a work on operative dentistry worthy of the era in which it is published.

The book is prepared with the same excellent attention to details that marked the work on "Prosthetic Dentistry," recently reviewed in this journal. The issuing of two books in one year, with every effort on the part of the publishers to present these in the

most satisfactory manner, is certainly worthy of special notice, and marks an epoch in dental literature second only to the publishing of the great work, "The American System of Dentistry," by the same house. These books should make part of the library of every dentist whose aim is to stand with the advanced workers in his calling.

Obituary.

DR. SAMUEL J. HAYES.

DIED at his home in Pittsburg, Pa., June 10, 1897, Dr. Samuel J. Hayes.

Dr. Hayes was born on a large farm near Johnstown, Pa., June 22, 1833. He entered college when about eighteen years of age, paying his way through a course of study principally by teaching. Subsequently he finished his training with a theological course and served several years in the pastorate, being considered successful both in the denominations of United Brethren and the Baptist. In consequence of a severe bronchial affection he was compelled to turn from his chosen profession, and took up the study of dentistry, which he followed during the remainder of his life, about thirty years. The defects of anæsthetic agents in general and the crude condition of the science itself early attracted his attention, and he thereafter devoted himself to the development of this art. In his numerous writings and lectures before schools and associations, both medical and dental, he advocated and sought to establish the rock-bed principles of the science, and is considered an eminent authority on the subject, his definitions for anæsthesia and asphyxia being so clear and forcible that they are accepted as standard. By his researches, and his invention known as "The Hayes Process of Anæsthesia," a means has been given the professional world of producing a true anæsthesia free from peril to operator and patient. This process is now widely known and used in the United States and, to some extent, in foreign countries.

At the time of his death Dr. Hayes was editor and proprietor of the *Dental and Surgical Microcosm*, a journal devoted to the interests of the dental profession, and fearlessly advocating the principles of the art and science of anæsthesia as they were opened up and established by him. He also had in preparation a book on this subject, which failing health compelled him to defer, and which is not yet completed.

COM.

Notes and Comments.[1]

INTERNATIONAL DENTAL GOLD-MINING COMPANY.—A communication from Dr. J. C. Townsend, formerly of Philadelphia, now of Colorado Springs, announces the formation of the above-named company. Dr. Townsend went to Colorado several years ago to regain his health. He is now a member of the Board of Trade and the Mining Exchange of Colorado Springs, and states that he will be pleased to serve his former professional friends in the East.

A HELP FOR INSOMNIA.—It is a well-known fact that a "drowsy" feeling usually follows a hearty dinner. This is accounted for by so large a part of the blood of the system being called to the stomach to aid in digestion, leaving the brain poorly supplied. The writer has for a number of years partaken of a light but wholesome lunch before retiring, and after a day filled with various duties, and the evening occupied with literary and other labors, he always finds ready and restful sleep following the midnight lunch.

Current News.

NEW JERSEY STATE DENTAL SOCIETY.

AT the Twenty-seventh Annual Meeting of the New Jersey State Dental Society, held July 21, 22, and 23, 1897, at Atlantic City, N. J., the following officers were elected:

President, Dr. J. L. Crater, Orange; Vice-President, Dr. J. Allen Osmun, Newark; Secretary, Dr. Charles A. Meeker, Newark; Treasurer, Dr. H. A. Hull, New Brunswick.

Executive Committee.—Dr. H. S. Sutphen, Newark; Dr. Oscar Adelberg, Elizabeth; Dr. F. E. Riley, Newark; Dr. C. W. F. Holbrook, Newark.

Membership Committee.—Dr. William E. Truex, Freehold; Dr. F. L. Hindle, New Brunswick; Dr. F. G. Gregory, Newark; Dr. William L. Fish, Newark; Dr. William H. Pruden, Paterson.

[1] The assistant editor solicits contributions for this department,—new methods, new remedies and formulas, or any short practical note which may prove of value to the practitioner or student. Address 1718 Walnut Street, Philadelphia.

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Original Communications.[1]

REGULATING WITHOUT EXTRACTION *VERSUS* EXTRACTION FOR REGULATING; SOME TYPICAL COMPARATIVE RESULTS.

BY WM. SLOCUM DAVENPORT, D.D.S., PARIS, FRANCE.

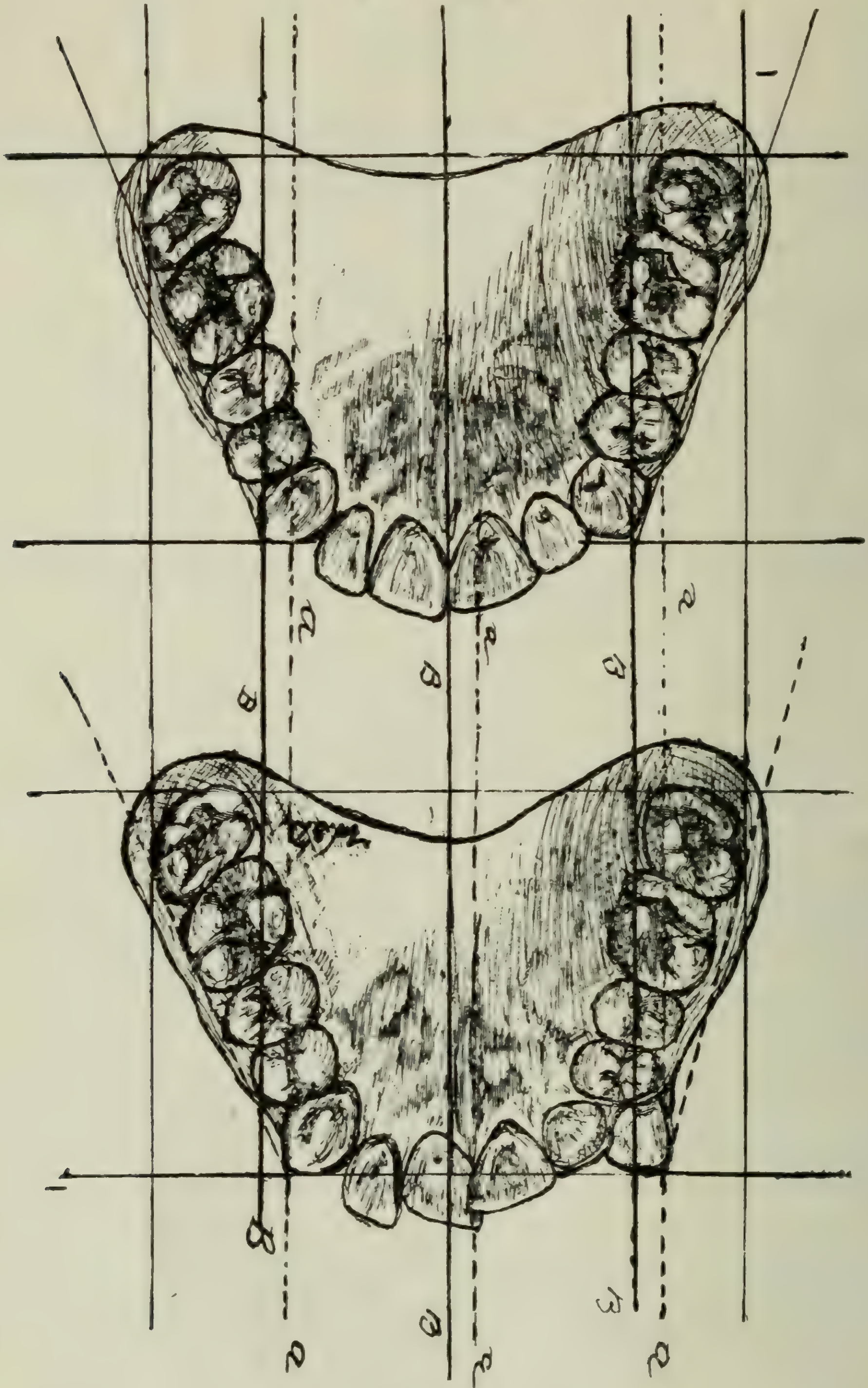
Case I.—Figs. 1 and 2 represent the mouth of an English youth sixteen years of age. By examining the position of the teeth by the aid of the superposed cross-lines one sees that the true median line, in Fig. 1, would pass through the left central incisor, three millimetres to the left, and that the central right lateral, left canine, and left bicuspids stand far within the normal arch, while the right canine stands out of the arch and the right bicuspids are nearly normal.

The first means employed towards correcting the irregularity was to adjust a band to the canine; a "Coffin W-plate" was arranged with linen ligatures doubled and tied at the left side of the split, as shown in Fig. 3. The patient was able to loop the free end of the ligature over the hook at the front of the band on the canine, when by rotating the plate (still out of the mouth) the ligature was twisted until sufficient tension was secured to furnish the degree of force desired, when the plate was pressed into

[1] The editor and publishers are not responsible for the views of authors of papers published in this department, nor for any claim to novelty, or otherwise, that may be made by them. No papers will be received for this department that have appeared in any other journal published in the country.

position. The effect of the force thus applied was to turn the canine into line, move the centrals and laterals forward, and move

Figs. 1 and 2.

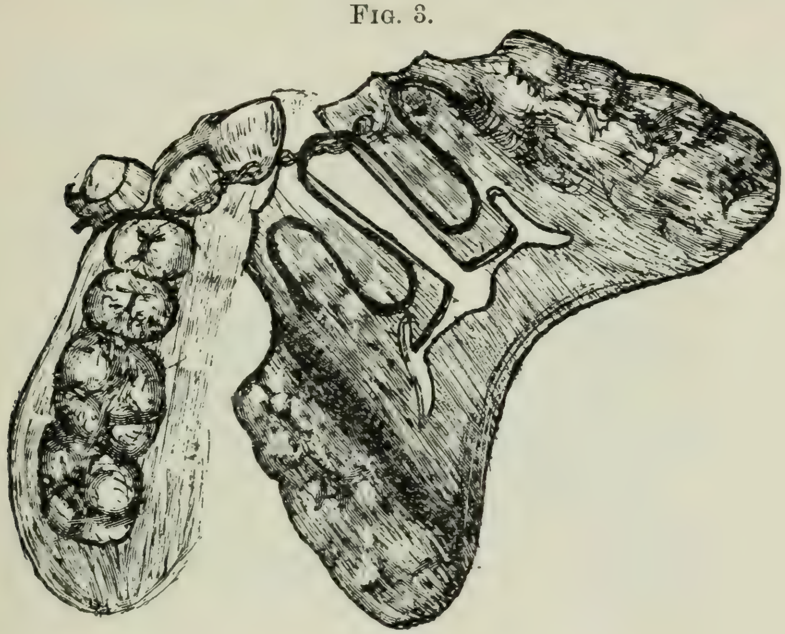


Case I.

all the front teeth to the left, restoring the relation of the teeth to the median line. By comparing the measurements of Figs. 1 and

2 by *a*, *a* and *B*, *B*, we find that the relative distance between the canines is the same, but that the six front teeth have been carried

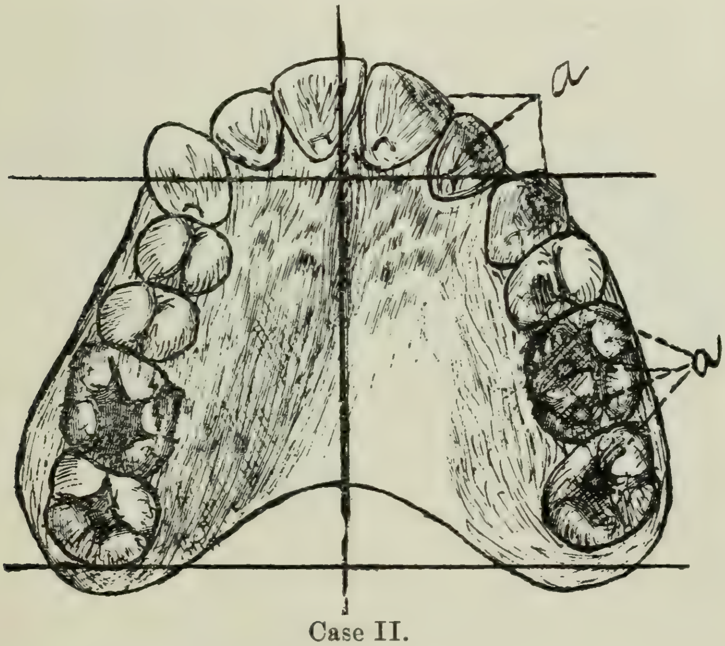
FIG. 3.



Case I.

to the left three millimetres, thus correcting the median as well as the general deviation. I saw this patient not more than twice a

FIG. 4.

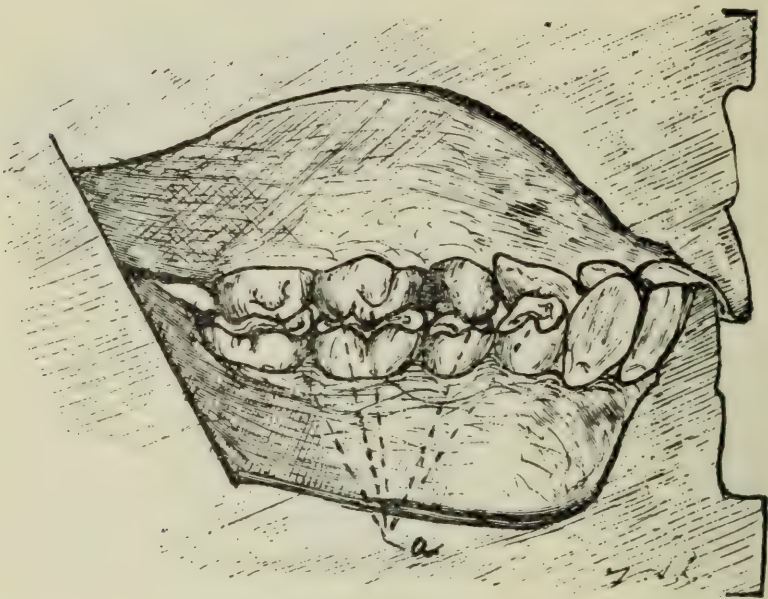


Case II.

week for two months, during which time the lower arch also was spread to conform with the upper arch.

Case II.—Figs. 4, 5, and 6, represent the mouth of the writer at the age of fourteen. The left upper second bicuspid and the right

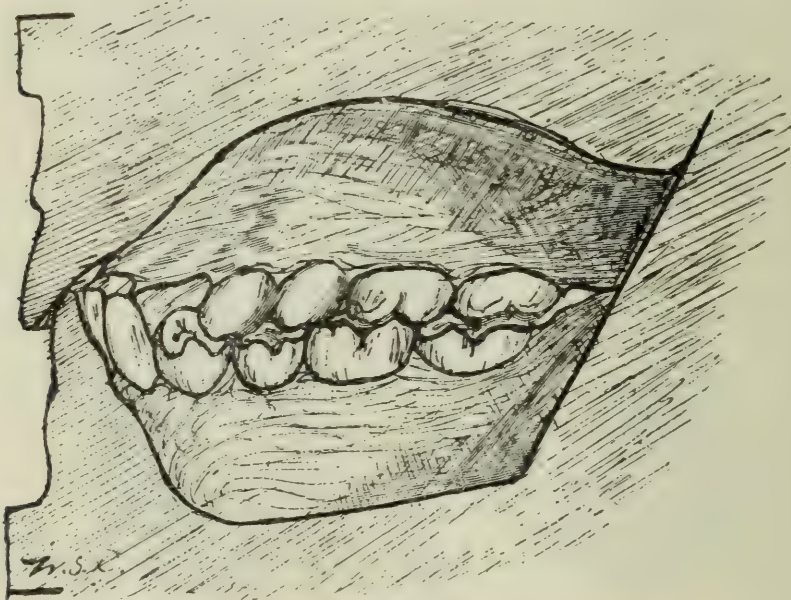
Fig. 5.



Case II.

lower lateral incisor were extracted with the alleged object of relieving the crowded arches and "to allow the prominent canine

Fig. 6.

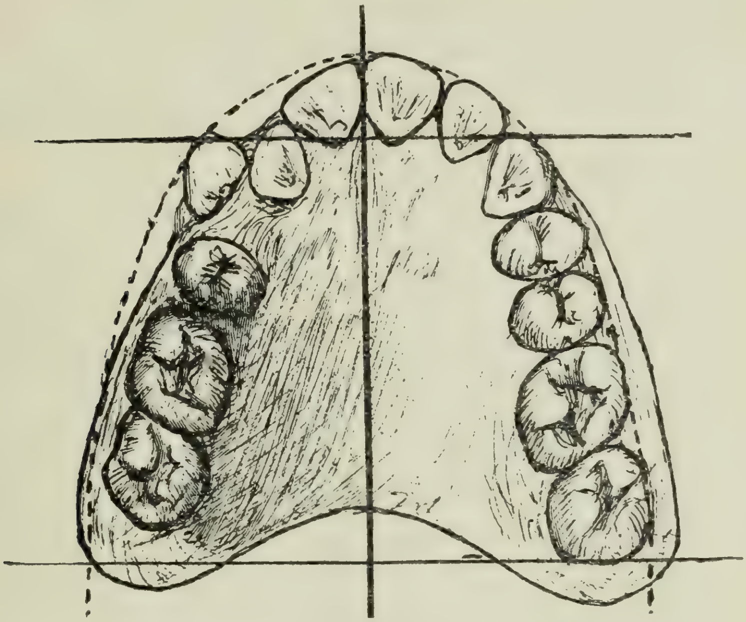


Case II.

to grow down." The space in the upper jaw left by the extracted tooth was closed partly by the dropping backward of the canine

and partly by the moving forward of the second bicuspid and molars. The new position taken by the bicuspid and molars

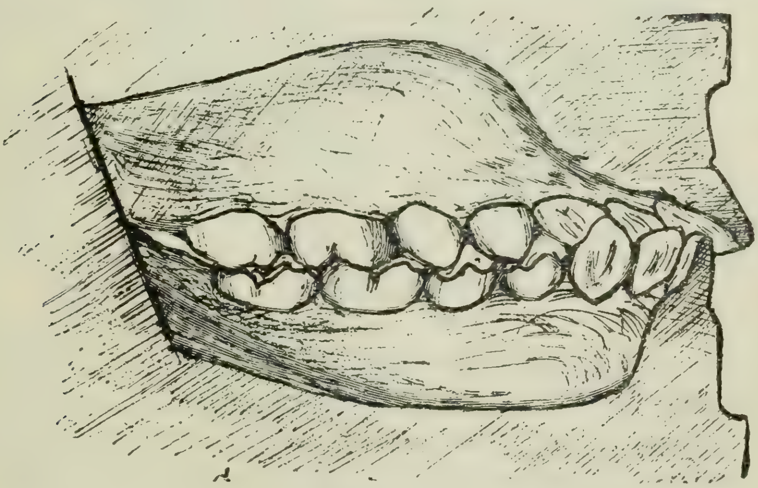
Fig. 7.



Case III.

produced an end-to-end or edge-to-edge articulation with the lower teeth, as shown in Figs. 4 and 5. When the jaws are at rest, the

Fig. 8.



Case III.

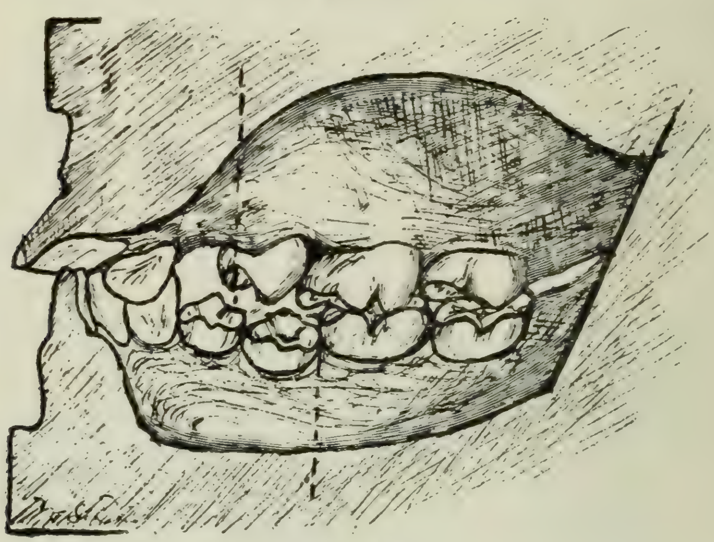
teeth on both sides of the mouth strike evenly, but with the lateral motions the cusps (*a*) of the left side are first brought into action, opening the bite and preventing a large proportion of contact on

the first plane of articulation, as described by I. B. Davenport in his papers upon the "Dental Arches of Man," *Dental Cosmos*, 1887, p. 417, and "Articulation of the Teeth," etc., INTERNATIONAL DENTAL JOURNAL, 1892, p. 7. The result is that the cusps (*a*) are much worn, and so sensitive at times as to render the use of the left side difficult and painful. Fig. 6 shows the right side of the mouth, the articulation being nearly normal; the teeth show no wear, and consequently are not sensitive, still the lower arch is a little contracted, owing to the loss of the central incisor.

CASE III.—Figs. 7, 8, and 9 represent the mouth of a young girl, fifteen years of age. At the age of thirteen a well-known dentist extracted the first right superior bicuspid "to allow the canine to grow into line," and after finding that the canine did not change its position, he even suggested that it might be best to extract the second superior bicuspid of the same side.

It is easy to see in Fig. 7 that the canines are in their normal position. The second bicuspid and molars on the right side have

FIG. 9.



Case III.

moved forward and stand far within the arch. Fig. 8 shows the ideal "interlocking articulation" as it exists on the left side. Fig. 9 illustrates the ruin of the articulation of the right side of the mouth, caused by the removal of the bicuspid, which was needed to hold the arch in shape, but the absence of which has allowed the contraction of the arch and forward displacement of the back teeth.

This is one case from a collection of many I can show where

dentists attempt to regulate the wrong tooth, making the case most difficult if not impossible. Let me say to those who extract "to give room," aid nature, and let "interlocking articulation" be your guide. Extraction for crowded arches should be a thing of the past. More attention should be given the sixth-year molars and their proper relation with each other, and if *that* is secured at an early date, crowded arches will become manageable and fewer deformed faces will be the result.

(To be continued.)

ELECTRICITY AND DENTISTRY.[1]

BY JAMES L. GETHINS, BOSTON, MASS.

In addressing the Massachusetts Dental Society on this subject I feel like saying "Brother electricians," as I know you are well versed in the art. You all know how useful electricity is in dentistry. You see it in the dental engine, mallet, mouth-lamp, and in the much-discussed subject of cataphoresis. The question of using electric batteries in dental work has been considered and discussed, and seems to have been quite successful in some instances, while in others it has been a failure. In fact, I think I may say in a general way that electric batteries have received quite a black eye in the profession. With an experience of twelve or fifteen years the most successful thing is the storage battery, because you have very low internal resistance, and you have practically a reservoir of electricity, and the voltage is utilized in the external circuit instead of being wasted in the battery itself.

The question of the batteries, their value in proportion to the cost of maintenance, and the amount of care they require is important. We can use bichromates and acids, but these batteries are condemned because difficult to handle. There is one question that has been often put in reference to this, and I am surprised to find in the text-books that the objection to the use of batteries has been the cost of zinc. That is all wrong. Zinc is very inexpensive, comparatively speaking. From two pounds of zinc we can get practically two horse-power at a cost of about ten cents. The practical difference in cost between using a dynamo to produce

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[1] Read before the Massachusetts Dental Society, Boston, June 2, 1897.

current and electric batteries is in proportion of about twenty-five to one. For this light class of work, running dental engines, mouth-lamps, cataphoresis, etc., storage batteries are successfully used.

With reference to the subject of cataphoresis, I have recently made several tests, and was somewhat surprised with the result. Different concerns are putting out apparatus involving all the way from five cells of battery to fifty or sixty. I recently made a test in a doctor's office in this city, and the doctor's apparatus was successfully used for this very purpose,—cataphoresis. He had what he called the volt-selector. It was an apparatus that struck me as unique, for the volt-selector moved rather mechanically. I did not think that indicated the actual pressure. I said, "Suppose we put the voltmeter on and see what we get." The result of that test was that I found when I moved the handle round, whether we had the battery current on or not, it indicated so many volts pressure. I wish to advocate very strongly in all transactions of that kind an accurate-reading milliameter, and I think this question of cataphoresis resolves itself into this. It certainly is not the voltage that accomplishes the work, as sufficient voltage to overcome the resistance only is necessary. It is the actual quantity of current. It is a case of osmosis, pure and simple, and the idea of building up a high voltage, and getting one volt at the tooth when there are forty-four at the outside circuit, strikes me as absurd.

I suppose, of course, that you are familiar with Ohm's law, but I find that in practice it is the gentlemen who are not using it every day who become confused. You must always remember that the volts indicate pressure, and the volts and ampères are regulated by resistance.

Now, I met another friend in the profession the other day, and he had what might be called a volt-selector, with simply ten cells of battery, and a switch in connection with it, so that he could use one cell at a time. That gave him one volt under the full strength of the battery. He found that five or six were all that were necessary to accomplish the desired result in from ten to fifteen minutes. The objection to that battery was that in removing the switch from one point to another the connection was broken, and the patient received a shock. His apparatus was very crude, but it appeared to me that he was getting down to first principles; he was actually finding how many volts he wanted at the tooth, and how much battery was required to do this work.

Now, I will give you a little illustration as to what this machine will do. We have on this dental engine four volts, and for that

matter we could construct a dental engine so that it would run with two. We do not require fifty or one hundred or one hundred and ten. I brought this to show that the current and not the voltage does the work. [Mr. Gethins here gave an illustration of the running of the dental engine.]

When I use the cautery-knife it takes about twenty ampères of the current. [Mr. Gethins here illustrated the use of the cautery-knife.] That illustrates the point I wish to get at. That has really taken about twenty ampères of current to develop that intense heat which you notice. There are only four volts back of it, and it could be done with two, and all of this kind of work can be done with a very small storage battery. Probably the actual voltage I am using there now is about three. The principle of cataphoresis is somewhat similar in effect to the formation of a storage battery. We take the lead plates and apply the current to them in the battery, we oxidize one plate and deoxidize the other by the passage of the electric current. It does not make a particle of difference whether I have ten thousand volts back of that amount of current or only two and a half volts, I get the same effect on these lead plates. It is the electrical action which takes place, and, of course, it is a question of the actual quantity of the current.

I think, in a general way, on this subject of cataphoresis that it would be very well, indeed, if the practical electrician and the dentist should get together and experiment to find out exactly how much current is required. In fact, in looking this matter up, I have ascertained in a great many cases that it has taken about four-tenths of one milliampère,—that is, a pressure of one volt with twenty-five hundred ohms resistance. That is a minute current which we are using in this service, and, as I have stated before, I think if I were advising the use of any apparatus, I should test it very carefully, and be sure to know what I was doing, because I know that the dentists do not know what the effect would be of too much current.

THE PREPARATION OF DENTAL ALLOYS AND CEMENTS.

BY LOUIS SHAW, M.D., BROOKLYN, N. Y.

In view of the recent investigations of Dr. Black and his papers on "Dental Alloys and Amalgams," I have thought that some simple and definite instructions for preparing alloys might be of value.

There are doubtless many who would like to use alloys made after formulæ suggested by these investigations, but not being familiar with the apparatus and methods necessary, think the preparation of a dental alloy more difficult than it is.

I shall not discuss the various ways in which an alloy can be made. Each manufacturer of an alloy no doubt has a way of combining the metals that he thinks best. But I shall describe a method that I have used for a number of years with satisfactory results.

For melting the metals I have used a gas-furnace made by the Buffalo Dental Manufacturing Company, and known as No. 40*a*,—Fletcher crucible furnace. This can also be had to work with kerosene. A plumbago crucible comes with the furnace. The other articles necessary are an ingot mould, a small pair of crucible tongs, and a short clay pipe-stem.

The silver is first melted, adding enough borax to cover its surface and protect it from the air. If the alloy is to contain copper, the blast must be kept up a few minutes to raise the temperature of the melted silver. The copper, in the form of very thin sheet or foil, is now added piece by piece.

If it is to be an alloy containing gold, the proper proportion of gold-foil scrap, wrapped in a piece of paper, is dropped into the crucible.

When the gold or copper is melted, the blast is kept on a few minutes and the other metals of the alloy added, those having the highest melting-points first. The tin, of course, will come last, and is best added in pieces the size of a large marble.

As soon as the last piece of tin is added the crucible is held in the furnace by tongs and its contents stirred vigorously with the clay pipe-stem, suitably fastened to a piece of wood. While still stirring, the metal is quickly poured into the ingot mould. The stirring and pouring before the metal comes to rest is to produce as uniform an ingot as possible.

Some may have difficulty in procuring pure metals. Pure silver, in grain form, is sold by gold and silver refiners. Pure copper, zinc, and tin can be bought from those who supply analytical and experimental chemists.

The ingot is readily reduced by a large coarse file, which must be kept for this purpose only. Passing a magnet through the thinly spread filings will remove any particles of steel from the file.

The filings must now be tempered as directed by Dr. Black, either by keeping them in an oven at a temperature of 120° F. for three days, or putting them in a glass flask and immersing the flask in boiling water for fifteen minutes.

Until I read Dr. Black's paper in the *Dental Cosmos* last August, I had been using two formulæ for alloys, based on Dr. Flagg's experiments. One was silver sixty parts, gold five parts, and tin thirty-five parts; the other substituted five parts of copper for the gold, leaving the silver and tin the same.

Lately I have adopted three formulæ suggested by Dr. Black. They are the following: one of silver and tin,—viz., silver, seventy-four parts; tin, twenty-six parts; one containing copper,—viz., silver, sixty-four parts; copper, four parts; zinc, one part; tin, thirty parts; and one containing gold,—viz., silver, sixty-eight and one-half parts; tin, twenty-five and one-half parts; gold, five parts; zinc, one part. Dr. Black speaks favorably of this last formula in the *Dental Cosmos* for December, 1896.

CEMENT.

As is generally known, cement powder is oxide of zinc, usually with some silica added with the idea of making it more resistant to wear.

In most of the directions for preparing this powder, oxide of zinc is dissolved in nitric acid, and the nitrate of zinc is afterwards heated to drive off the nitric acid, leaving zinc oxide.

This part of the process is enough to deter most dentists from trying to prepare cement powder, as the fumes of nitric acid are very corrosive, and difficult to get rid of, except through a chimney arranged for carrying off acid vapors.

This dissolving of the oxide is not necessary, and, by omitting it any one can prepare the powder with little difficulty. Most oxides of zinc made in the United States are too impure for dental use.

French oxide of zinc is much purer and makes a very good

cement. Hubbuck's English oxide of zinc is the purest I have been able to obtain, and produces a very white cement. All other oxides I have tried produce a more or less yellow product. This yellow color is owing probably to traces of the oxides of other metals. These are not sufficient, however, in the oxides of zinc prepared for medicinal use, to affect their value for cement. If a white cement is not desired, they answer very well.

The oxide is placed in a sand crucible and the cover luted on with potters' clay mixed with water.

The crucible is now placed in a coal-fire—a range will do—and covered with coal, so that it will all be brought to a red heat. After being held at a red heat for two hours, it is removed and allowed to cool.

The oxide is now removed, and rubbed to a fine powder in a Wedgewood mortar, when it is bottled to keep it from the air.

The liquid is made by dissolving in water sufficient glacial phosphoric acid to make a dense syrupy solution.

It is difficult to state the exact composition of the liquid chemically, as all commercial glacial phosphoric acid contains from seven to fourteen per cent. of sodium phosphate. On being dissolved, the glacial phosphoric acid slowly takes up another equivalent of water, and finally a third, becoming at last ortho-phosphoric acid. The liquid may then be a mixture of the three phosphoric acids holding sodium phosphate in solution. My knowledge of cement liquid is unsatisfactory, and I cannot always get uniform results with different lots. I have not been able to get pure glacial phosphoric acid, but hope with further study of the phosphoric acids to be able to prepare a liquid that will be always uniform. The process described, however, produces an oxyphosphate cement that compares favorably with any I have purchased, both as to working qualities and insolubility.

CLINICAL REPORT ON METHOD OF OPERATING.[1]

BY DR. H. C. REGISTER, PHILADELPHIA.

INDIVIDUAL methods of operating are of minor importance if they do not possess a qualifying reason why they are so done, embodying a "principle" that applies in all like conditions. That

[1] Read before the Academy of Stomatology, March 23, 1897.

which is involved, as a principle, in the manipulation of gold as performed by myself on Saturday last, consists in adapting gold in regulated lamina, in opposition to an irregular form of cohesive work, and the fixation by forcing it to place by strips of bibulous paper or old soft linen, thus making a tight joint by packing the gold to every point of contact by the same effort, in opposition to retainers, cohesive and otherwise, which when done by instrument points are more likely to let some inequality remain, and also wound the finished tooth tissue, which is detrimental to the saving quality of the filling so far as it makes an inequality, thus preventing the hardening of the dentine beneath it.

The calcification of the fibrillæ, I claim, always takes place in forming a zone of secondary tissue in a filled tooth when the mechanical and physical relations are made compatible with each other to the exclusion of recurring exciting causes of caries. Metal fillings, through their thermal irritation, produce that result sooner than the zinc or gutta-percha. To this end the formation of cavities should conform to the natural cleavage of the enamel, which radiates from the stratum granulosum to the periphery, and, after Williams, are held together by the interprismatic cementing substance. An enamel wall, under the best conditions for its future preservation, should stand in this relation to the filling, the length of the enamel prisms, where possible, reaching from the enamel cuticle to the stratum granulosum, with the surface made smooth. In all cavities thus formed we get, as an anatomical result, a V-shape to a greater or less extent, this being always natural as applied to enamel.

In connection with this, and all other forms of cavities, I cannot lay too much importance upon the sterilizing and alkaline influence of bathing the cavities with iodine, and decomposing it and all carbohydrates and starchy matter, including germ-life, which is in the main composed of the latter material, and of placing the inner enamel and dentine in an alkaline or neutral condition before filling. The changes in the tissue, I believe, are as great as they are apparent, permitting and producing an antithermal change through secondary dentine more quickly, and anticipating the action of germ-life that may be left in the tissues.

The use of a matrix in connection with this method, and all others as well, should stand as a necessity only, in giving expression to the cavity,—*never a positive, fixed, artificial wall!*

As the environment of the tooth will be the exciting cause of future caries, the filling must anticipate, so far as possible, the

dissolution of the interprismatic cement or the calcoglobulin, as pointed out by Williams, before a recurrence of decay can take place in any part of the filled border properly protected by the gold. To do this best is the aim of all honest operators. I present this method not as one of an hour, a day, or a month, but one that has stood the clinical criticism of fourteen years as a system, with the good work continuing to preserve badly broken-down teeth, as observed from carefully kept charts that tell the conditions then and now.

When one or more of the walls are broken, a matrix becomes a necessity, and here planished copper or German silver works best with me,—always fitting it to the individual case. This may be done by soft soldering the ends or using the silk ligature, which I generally prefer, winding it round and round the matrix to its width, which comes to the bulbous portion of the tooth only. To planished copper, which is rendered so pliable and dead by annealing, I give the preference for making all kinds of matrices.

If it is desired to give the filling an oval form or contour at the knuckling point of contact, it is only necessary to hold the copper strip, before cutting, in the palm of the hand or some fairly soft surface and burnish it to the extent required. The ligature takes it to place uniformly throughout the boundary line and leaves a mould to be replaced by the filling.

Gold cylinders, the length of which correspond to the cross-axis of the cavity, are now laid on the bottom and sides and pressed to place by bibulous paper folded once, or as many times as will correspond with the work in hand; and soft linen cut into strips is to be used in like manner without folding, and in its preparation must always be cut, never torn. After the gold has been pressed to place under paper by "plugging pliers" (a special form is best), the ends of the cylinders are *turned over* and *around the cavity*, *between* the *tooth* and the *matrix*, or the first cylinders may be placed and adapted under the bibulous paper, the edges of these turned over the border of the cavity at the cervix, and the matrix then applied as described, pressing against the cylinders, the operation being continued by the use of mat gold and malleted to place with the paper upon the gold, followed after its removal with proper small, smooth points until all parts of the boundary, as you progress, are filled *without the instrument coming in contact with tooth-structure.* After the enamel has been thus protected, to a greater or less degree, not being so essential as with dentine, the cohesive gold can be added wherever the masticating surface or contour

calls for it. In the larger restorations the borders of the filling should be composed of cylinders carefully laid in contact with dentine and enamel throughout the joint contact in lamina. The centre or body may be filled with mat or crystal gold, as the air-spaces in the work are in no way detrimental. The time thus gained is all secured by the use of soft gold, it permitting of about two-thirds of the cavity being filled in one-third the time, as a gain over cohesive work.

No special retaining device, as a rule, is necessary, other than a slight irregularity that may naturally exist; otherwise undercuts should be slight, and to see that the pounding and triturating forces of mastication are met by the cylinders being anchored as much within the body of the tooth as extending beyond the cavity in restoring the contour to any required form.

This method of operating, I believe, is in direct line with the latest discovery in histological research in its relation with the several anatomical parts of tooth-structure, both mechanically and physically related, and as a protection from the microgerm environment. Thus do we find non-cohesive or soft gold laid in lamina in juxtaposition against dentine and enamel, in contradistinction to small pieces being added cohesively in retainers, to be no veneer but of better grain, and being opposite in all its relations as a tooth-preserver, both physically and mechanically.

GOLD-SHELL CROWNS ONE HUNDRED AND FIFTY YEARS AGO.

BY DR. WILLIAM H. TRUEMAN, PHILADELPHIA.

A French work, entitled "Essay d'Odontotechnie, ou Dissertation sur les Dents Artificielles," written by M. Mouton, a surgeon-dentist of Paris, and there published in 1746, is, so far as I now know, the first work written exclusively upon prosthetic dentistry. In it the writer describes and advises the use of the device we now know as a gold-shell crown,—a cap of gold covering, and made to accurately fit the whole exterior of a tooth whose usefulness has been impaired by loss of substance. He especially advises and urges their use upon the molars. He notes that objection may be made to the gold being conspicuous when they are placed upon teeth farther front, and states that when there are no other objections to their use upon these conspicuous teeth than the color, he

overcomes this by enamelling the front of the cap, making it the same color as the adjoining teeth.

The work is not technical, but is written for popular reading in an instructive and entertaining style, and, while not entering into constructive details, out of place in a work of this character, it gives a fair insight of the art of prosthetic dentistry as it then existed. To the operative branch he refers only incidentally. He earnestly advocates saving to the utmost the natural teeth, and to this end strongly urges frequent and regular visits to the dentist, cleanliness, the prompt and thorough removal of deposits, and careful attention to all cavities of decay as soon as they appear. Among the materials he uses in this art, the only metal named is gold. This he uses in the form of wire for attaching false teeth to natural teeth or roots; in the form of leaves, as he expresses it, "pour en remplir les cavités faites par la carie." The word "remplir," as here used, means "to fill," "to cram," etc., and no doubt from it we get our expressions "plug" and "plugging," "fill" and "filling." He also uses gold in plate, or thin lamina, for regulating. For the benefit of those who may be interested, I copy from the original his remarks upon gold caps. It is old style, ſ being used for s. On page 137 he says,—

"Il faut recouvrir la Dent uſée d'une calotte d'or, qui incruſte toute ſa ſurface extérieure, et qui ſoit ajuſtée de maniere que elle ne puiſſe intercepter aucune portion d'alimens. La Dent oppoſée, et les alimens n'ayant plus alors d'action ſur le corps de la Dent ainſi revêtu, elle eſt préſervée, quelque tendre qu'elle puiſſe être, du dommage dont nous parlons.

"Cette pratique eſt très-avantageuse pour les groſſes Dents, ou Molaires, attendu qu'elles cauſent beaucoup de douleur, quand la Dent commence à s'uſer près du nerf, et qu'il n'y a d'autre moyen pour l'arretêr, que celui de ſacrifier la Dent. On eſt ſûr de ſa conſervation, ſans craindre qu'elle cauſe dans la ſuite aucun mal, lorſque l'on s'y prend de bonne heure et à tems, pour la faire recouvrir. L'inconvénient que l'on peut trouver à faire la même opération aux petites Molaires et aux inciſives, eſt qu'étant placées au-devant de la bouche, elles ſont toujours expoſées à la vûe par les divers mouvemens que les lévres ſont, ſoit en parlant, ſoit en riant. Les yeux, ſans doubte, ſeroient choqués d'une couleur auſſi diſparate, que celle de l'enveloppe que je propoſe pour les Molaires; mais lorſque la diſpoſition des inciſives ne s'oppoſe pas à cette reſſources, l'on peut faire émailler l'extérieur de l'enveloppe de la même couleur que les Dents voiſines."

SOME FEATURES IN BRIDGE-WORK.[1]

BY H. C. REGISTER, M.D.

In Dr. M. L. Rhein's essay upon "Ideal Bridge-Work," read before the First District Dental Society of New York, December, 1893, he states, "At a time when mechanical skill in our laboratories was at its lowest ebb, one of the greatest operative dentists that ever lived, Marshall H. Webb, felt the need for something in the prosthetic line which would approach the ideal of excellence which he attained in his operative work. He took his cue from the work performed by Dr. B. J. Bing, of Paris, and first described in the *Dental Cosmos* of October, 1869, by Dr. H. D. Bennett, of Paris. Dr. Bennett's paper received little attention in this country until 1873, when Dr. Webb began the practice of inserting single artificial teeth into spaces, making anchorage in cavities in the approximal surfaces of the adjoining teeth. His method of work, as is well known, was a vast improvement on the style of that done in Paris.

Reports of isolated specimens of bridge-work are published as early as 1805 by J. B. Gariot, and in 1820 by C. I. Delabarre, and by Dr. S. S. Fitch, of New York, in 1829, and by Dr. W. H. Dwinelle in 1856. To Dr. B. J. Bing, however, is due the credit of reviving this antique method of inserting artificial teeth.

"A paper read by Dr. H. C. Register, entitled 'Grafting Artificial Crowns in Lieu of Plates,' before the Odontological Society of Pennsylvania, on January 8, 1881, shows that he had for some time been following Webb on this style of work."

This influx of new methods of inserting artificial teeth brought back to our dental laboratories the gold-workers, and private courses for mechanical dentists in plate-, bridge-, and crown-work were a source of considerable revenue to private instructors.

In this manner no one dares to contradict that bridge-work has been a great blessing to the profession. It has been the means of educating the men engaged in the mechanical construction of these devices to a point nearer to perfection in mechanical technique than has ever before existed in dentistry. It has also served as a stimulus to the inventive capacity of dentists, as is readily demonstrated by the vast number of methods of inserting artificial teeth without plates, which are now practised.

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[1] Read at a meeting of the Academy of Stomatology, April 27, 1897.

In this relation I wish to say a few words in further advancing this really great possibility in prosthetic work. Dr. Webb, in discussing my paper in 1881, believed it possible to attach more than one tooth successfully, although he had never performed that operation himself.

In modern bridge-work there are two essentials,—namely, perfect retaining device upon the root attachments, and perfect cleansing surfaces. These two conditions are essential to the future usefulness of the fixture. Dr. Rhein criticises the so-called self-cleansing spaces generally made, as not only receptacles for *débris*, but as causing constant annoyance to the tongue and interference with speech.

I say with pleasure that I have never placed a bridge with these *cul-de-sacs*, always adhering to the principle of restoring lost anatomical forms.

To these two previous essential conditions I would add a third, applicable to the immediate oral teeth in their artistic relations. I desire to call your attention to the uncertainty of the present method of attaching bridges and crowns, especially those forms where several anchorages are utilized.

Phosphate of zinc is the agent in general use, and where the fixture contains several abutments its application must be made so rapidly that without intelligent assistance there is difficulty in properly adjusting it. It is a matter of considerable concern, after a beautiful piece of mechanical work is ready to be placed in position, whether we succeed or fail in making everything perfectly secure, and carry the bridge to a proper adjustment. To do away with this apprehension of failure, time should be at the disposal of the operator, and for greater artistic results a *better* crown can be made use of. To get time one attachment should be fixed, and the others following it in rotation, under conditions that the cementing or connecting process should be of such a character and disposition to resist to the greatest extent bacterial invasion.

We might say of phosphate of zinc, with our present knowledge of incipient caries, that it is a preventive of bacterial intrusion, less its comparatively rapid dissolution. This contra-disposition, in connection with its lack of strength when stress is applied, makes it non-dependable for carrying a bridge many years, unless the fixtures be so accurately made as to be self-supporting. In combination, however, with an alloy freshly cut and of good test, thoroughly mixed together, we have almost an ideal preserver of tooth tissue, less its inartistic appearance,—a material into which

is worked a matrix that is mutually self-sustaining, both for filling and anchoring bridges or crowns. To apply this retainer in bridge- or crown-work the porcelain face or veneer should be of special form and appropriately made, so as to allow not only of manipulation but of artistic construction as well.

The filling of root-canals with alloy, and the foregoing combination of it and phosphate of zinc, is the method that has proved most successful in my hands. To apply a retainer of this character, the filling must be worked in by manipulation, either on bridge or crown, and the supporting base must be appropriately made to permit the filling-material being placed with confidence, and the artistic relations fully carried out in the work.

I made use of a crown that contained an inverted dovetailed groove placed on the back of the porcelain faces of the cuspids and incisors and the interproximal spaces of the bicuspids and molars.

One of the principal features in crowns of this character is in allowing the root to be filled from the labial or buccal in contradistinction to the palatine side, and of placing the supporting fixture before the porcelain faces are arranged in place, filling each root separately under perfect observation and without hurry, and in case of accidents these crowns are easily duplicated without damage to the fixture.

These teeth between the abutments were placed upon a saddle exactly their own diameter, which rested upon the alveolar ridge, the necks being enclosed in a ferrule for the bicuspids and molars, and in the immediate oral teeth in a half or whole ferrule as best suited the artistic result to meet the individual case. You will thus notice in the illustration, if at all familiar with the Mason crown, recently placed upon the market, and which opens a great possibility in prosthetic bridge- and crown-work, that they include the same means of attachment so far as the principle is involved.[1]

This method in no way bears upon the ingenious method adopted by Drs. Rhein and Andrews of placing split shells over inverted crowns and fixing them to place with a key.

The principle involved here is in the use of the roots of the teeth, hermetically sealing the same under observation, gaining greater strength in stress, and protecting the underlying tooth from carious influences.

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[1] The principle involved, and the type of crown employed in the Mason adjustable crown, have been used by Dr. Rhein for several years. He states that the device was suggested to him by Dr. Van Woert.—(H. W. B.)

You will notice, if you are at all familiar with the Mason crown, that the face slips off and on the backing to the diameter of about half of the face of the root. Thus in placing the base of either crown or bridge into position, and the porcelain face removed, you have half the root exposed by simply opening up a floored ferrule, and thus exposing the pulp-chambers. Where half ferrules are used the same result, of course, is gained.

The pin for anchorage into the pulp-chamber can be soldered directly to the backing, or a split post, with the ends bent in opposite directions resting upon the ferrule, packed to position through this opening.

Where amalgam is used slight oiling of the gold should precede the adaptation to prevent its amalgamation. Everything being ready, the parts dried, a creamy compound is made of phosphate of zinc alone, or equal parts of phosphate of zinc and alloy thoroughly rubbed together under a heavy spatula, and the inner edges of the ferrule anointed and pressed to place.

If preferable, in this part of the work phosphate of zinc can be used alone; this is to fix the bridge or crown to position.

After drying that part of the retainer and with an excavator removing from the canal through the opening into root all excess, and desiccating by means of compressed air, repeat the combination mixture, except to make the second and other mixings stiffer in the phosphate of zinc and drier in the alloy. After thoroughly mixing with the spatula manipulate with the fingers into a putty-like consistence, rolling it in the fingers to about the size of the opening in the canal. If the retaining post is attached directly to the bridge, pass it in piece by piece till the parts are thoroughly packed.

If using a split post, after filling the upper portion of the canal, press it home to position, and fill the same as if it were permanently attached, finishing the last layers with alloy alone. Where a half ferrule is made, this is carried to the edge of the root under the gum festoon. The tooth crown, which has previously been properly adapted, is now connected with the base either with phosphate of zinc or chloro-percha.

Where it is desirable to resist the greatest stress I recommend the use of alloy alone, packed in the same way as the preceding mixture.

In spaces between the abutments, where resorption has followed the extraction of teeth, there is characteristic tooth and gum contact which gives an artificial appearance to the facial expression.

To overcome this artificial appearance it is necessary to reproduce the gum festoon. The reforming of this on the faces of the teeth consists in taking the mucous and submucous tissue, with some fibre, from the palatial or lingual portion of the jaws in the form of flaps cut in festoons as wide as the teeth where they join at the interproximal spaces, and stretching it over the faces of the teeth, allowing the flaps to be twice the length required, proportionately large to allow for shrinkage.

The granulating process from where these flaps are taken may be packed with iodoform gauze or cleansed with an antiseptic wash. The cutting can be done with very little pain with cocaine or eucaine hypodermically injected; and where specially desired by the use of the Mason crown, one or more operations can be done at a sitting.

This is the method which I have employed in producing the plastic reformation of gum festoon. But there are conditions where one flap to each space can be made and laid over the faces of the teeth and a stitch made between each interproximal space, drawing it tightly around the necks of the teeth and trimming away excessive gum tissue in the reforming of the gum festoon.

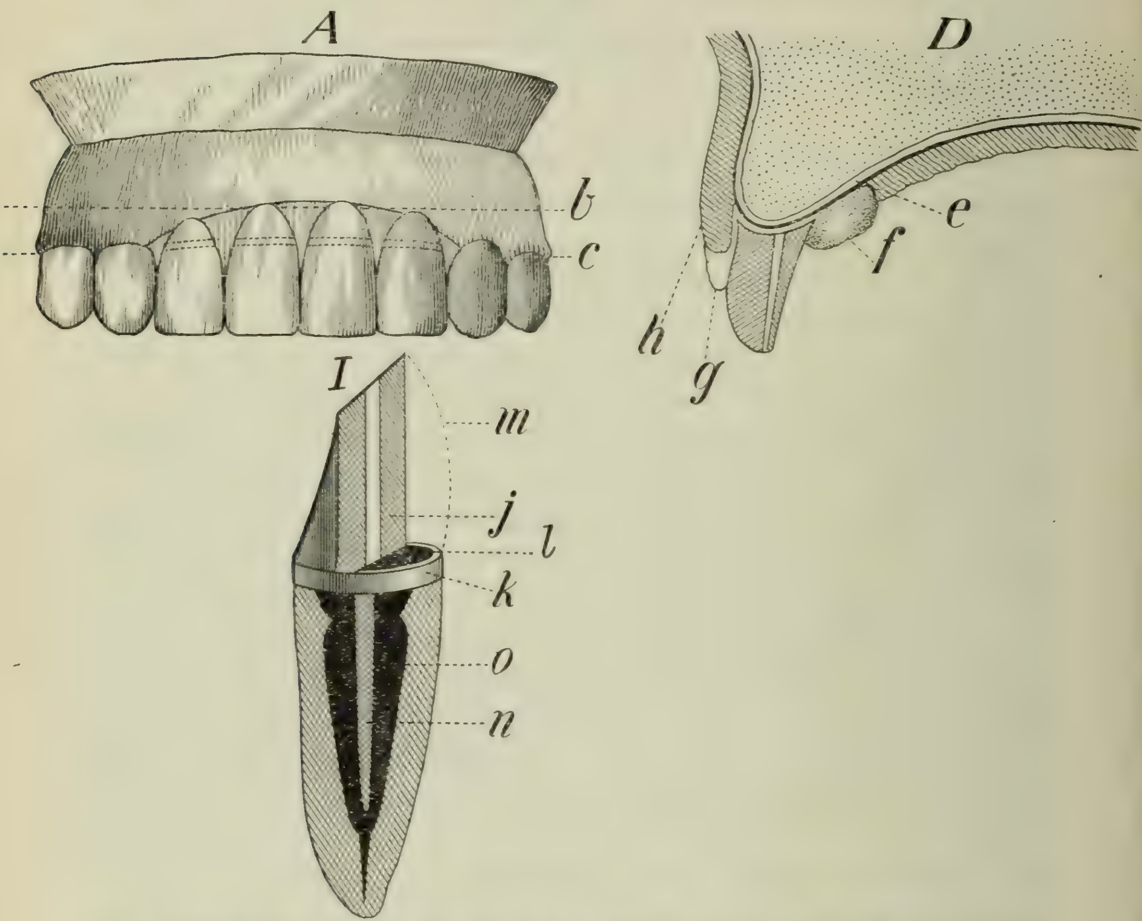
The base of the bridge being in position, the crown faces are first placed on the root abutments. I prefer to make these attachments with the phosphate of zinc, which will remain firm for several years, and can be readjusted easily without disturbing the other part of the fixture. The flaps, after being cut and dissected away from the periosteum, are caught by ligatures passed under them and drawn forward, thus suspending all hemorrhage; as many being done at one sitting as is advisable under existing conditions. After which the crowns are flowed over on both contacting surfaces with phosphate of zinc and pressed to place, pinching into the interproximal spaces, followed by thorough drying, when the ligatures can be removed, allowing them to fall over the faces of the teeth, and the palatine portion packed with iodoform gauze. This is not essential, however, as an antiseptic wash answers every purpose.

There are conditions, however, when iodoform gauze can be packed on the palatine portion (under the bridge) to advantage, in giving a better expression to the gum festoon during granulation by causing it to bulge.

In a case performed by myself last winter, a most gratifying result was secured for the four incisors attached to the cuspid roots, where a crescent-shaped arch was caused by recession, the

centrals being fully twice the length of the cuspids. This discrepancy, which was very unsightly on account of the incisors having to be so much longer, was wholly overcome by using long flaps over the centrals, and shorter ones over the laterals, reproducing the gum on a line and festoon between the abutments. This is illustrated in Fig. 1.

FIG. 1.



A, model showing great absorption of alveolus between cuspid roots and nearly two-eighths of new gum festoon reproduced: *b*, original line; *c*, new line.

D, showing how flaps were taken from palatine portion and pushed forward to labial surfaces: *e*, muco-periosteum; *f*, iodoform or nosophene gauze, forced in and tied; *g*, extra long flap to allow for absorption; *h*, new gum festoon.

I, Mason crown enlarged for showing method of attaching to root with alloy: *j*, Mason backing; *k*, ferrule,—can be made a whole or half ring as required; *l*, opening to canal on labial side, through which filling is packed; *m*, Mason crown, pushed to place, covering the filling space; *n*, pin in root; *o*, filling around pin.

I saw this patient several months after operating, and the gum presented nearly a perfect line between the cuspids, and the granulation which had followed the filling in of the spaces from where the flaps were taken presented a perfectly healthy and normal

appearance. A singular and gratifying result from this operation, in connection with the plastic work, was a perfect tightening of the roots, which before presented considerable luxation.

With that class of patients showing the gum-line of tooth contact this plastic operation of gum-formation opens up a new line of possibilities in giving most pleasing results, which I feel sure will find some commendation in artistic bridge-work.

THE PHYSIOLOGY OF CATAPHORESIS.[1]

BY WESTON A. PRICE, CLEVELAND, OHIO.

We will at this time confine ourselves to a consideration of the phenomena attending the application of an electric current to the human body, with and without an interposing medicament, and especially as applied to the dental organs.

There are three distinct theories as to the forces at work and their particular action in these processes, and since there is such a diversity of nomenclature and variety of method for the application of these forces, we will include in this consideration all the methods of applying an electric current to the dental organs for producing anæsthesia, whether used in conjunction with a medicament or not. These theories are,—

1. The polarization of the tissue, producing an inhibition of the sensory impulse.
2. Osmosis.
3. Electrolysis.

The first theory provides that when an electric current is applied to a tooth with or without a medicament, the conditions produced are due entirely, or almost entirely, to the effects of the current, and not due to the medicament, other than its assistance in conducting a current. Another division of this first theory is that a constant current applied to the dental branches of the trifacial nerve, with the positive pole applied to the tooth and the negative pole over the Gasserian ganglion, inhibits the normal sensory impulse. The leading advocates of this theory maintain that a certain and definite amount of current applied in the manner just described will produce a condition of anæsthesia in the tooth, and

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[1] Read before the American Dental Association at Old Point Comfort, Va., August, 1897.

that either too little or too much will not produce this condition. They call it "short-circuiting" the nerve. For this application, the positive pole of the constant current is attached to the dental engine in such a manner as to make the bur the electrode, the hand-piece being insulated, and the negative pole is applied over the Gasserian ganglion upon the same side as the tooth to be operated on, which is perfectly insulated.

The next theory provides that the medicament which is applied under the electrode is the agent which does the work, but that it is carried in by physical force; that in some way, just as a stream of water carries sediment with it, so the electric current carries the ingredients in solution with it through the solvent and through the tissue. The advocates of this theory have furnished almost all the literature that has been written on the theory of cataphoresis since its advent; and among its ranks are to be found many of the foremost men in the dental and medical professions. The most exhaustive articles bearing on this theory have been written by Drs. Morton, Peterson, and Phillips, while a number of shorter articles have appeared from other writers.

The theory of electrolysis provides practically that all the effect produced in passing an electric current through a medicament, as applied in cataphoresis or in any other way, is electrolytic. I have not been able to find a .single person among the writers for the medical and dental profession defending this theory; it may, however, be worthy of consideration.

As the next steps let us consider,—

1. The physiological effect of a constant current on nerve tissue.
2. The laws governing osmosis.
3. The laws governing electrolysis.

I have demonstrated elsewhere, and verified repeatedly, that the resistance through a tooth, accordingly as the cavity is wet or dry, will vary all the way from thousandths to hundreds of thousandths of ohms. I have measured cavities in dentine after dehydrating, and found them to vary from twenty thousand ohms to over one milllion ohms, and in different parts of the same cavity almost that amount of variation over the surface of the dentine alone; through the enamel, of course, those figures would be multiplied by thousands.

Two things must be evident to every one at a glance,—viz., that in delivering the current to a tooth from the bur as the positive electrode, it is impossible to have a uniform amount of current flowing, as the bur is moved to different parts of the cavity, owing

to the variableness of the resistance of the different parts of the cavity, and that with so very high a resistance it would be impossible to have more than an extremely weak current flowing, unless the potential were very many times that used.

It has been demonstrated by Nernst and others that "the osmotic pressure is independent of the nature of the solvent, and, in general, obeys the laws of gases." Various proofs for establishing this law are given in Nernst's "Theoretical Chemistry," 1895. It has also been demonstrated that "solutions having the same osmotic pressure can be obtained by dissolving equimolecular quantities of the various substances in the same solvent."

Since the nature of the solvent has nothing to do with the osmotic pressure it at once becomes obvious that,—

1. It does not matter what solvent we use for our cocaine, providing it is the force of osmosis that accomplishes the work.

2. Since the osmotic pressure is in different proportion to the concentration, the solution should be as nearly saturated as possible.

3. Since the osmotic pressure is increased to a definite extent by each degree increase of heat, the solution should be kept as hot as possible.

These observations hold good for practical application, if the force we are dependent upon is osmosis. We can make our deductions both from a clinical and theoretical stand-point. Will osmosis carry cocaine into dentine to any considerable extent? To answer this, I have sealed a saturated solution of cocaine into cavities for two days, and again for two months, without producing anæsthesia except on the very surface of the cavity. I have also applied it for some time on an exposed pulp, and could not go very far into it. Sulphate of strychnine and bichloride of mercury applied on cotton to the chest of frogs produced no physiological effect, while with a current, death was produced in a few minutes. This at one stroke seems to answer the question as to whether osmosis alone can produce this condition.

We are forced to conclude from the clinical observations and theoretical probabilities that osmotic pressure is not the force on which depends the transmission of cocaine through dentine into the pulp. This brings us to a consideration of the last question, —viz., What are the laws of electrolysis?

What is electrolysis? It is the change that is effected by the passage of an electric current in so far as the electricity exhibits itself as such.

How is electricity conducted? As expressed by Nernst, and

translated by Palmer, "The conveyance of electricity in conducting substances may happen in two different ways,—viz., with or without the associated transportation of matter. The latter happens in the case of metallic conductors (first class), the former in electrolytic conductors (second class); hence these are called conductors of the first and second classes respectively."

A solution conducts electricity the better the more numerous the ions and the smaller the friction which the ions encounter in their migration. This conception may be applied unchanged to every substance which conducts electrolytically, whether gaseous, liquid, or solid, whether simple or mixed.

Let us now apply some of these laws of electrolysis to the particular process with which we are interested. Suppose the positive pole be applied to the dentine of a tooth and the negative to the cheek. An interposing layer of medicament, say cocaine, in watery solution, is between the metallic positive electrode and the dentine. The only way electricity can get from the metallic positive electrode to the metallic negative electrode is by the dissociation of some of the molecules, in every substance of the second class through which it passes. In every part of the course through the cocaine solution, the dentine, the pulp, the connective tissue, the blood-vessels, the muscular tissue, and the sponge on the negative electrode, there will be a cleavage of some of the molecules of the various chemical compositions into a positive and a negative ion. These ions with equal force and chemical equivalents start on their respective journeys towards their opposite poles. They meet with friction which varies from different ions, and since they have the same force behind them, pushing them, their velocities will vary with varied resistance. If in their course they meet a new ion, or an element or compound for which they have a greater affinity than the force which separated them, they will unite with it until they are again called into service. Unless an ion found such an affinity, it would keep on going until it got to the metal plate of the negative electrode, and if it could unite with it would do so; if not, it would be deposited upon it or be liberated in the form of gas.

According to the older theories, there was supposed to be a physical force exerted in some manner by the electric current, and this theory has yet its advocates. There is a newer theory, however, which is made by its introducer to explain all the phenomena. Its author is Nernst, of Göttingen, Germany. He maintains that there is no transmission of matter, except the ions themselves.

The final goal is, of course, to diminish the time. I do not

believe this will be done by seeking directly for a substance that has a high osmotic pressure, but rather in seeking for a reaction that will produce the most active ion. It is true, however, that substances that have a high osmotic pressure have good conductivity. Since the amount of current we can use is limited by the pain limit of the tissue, and the amount of electrolysis is a constant expression of the strength of current, of course the amount of chemical energy we can liberate is fixed, and we cannot hope to change this unless we can change some of the laws of their physiology, electrolysis, or chemistry.

We have left these unfixed conditions to modify,—viz., to select the ions with the greatest migration facility, and which themselves, or the compounds they will form, will produce greater physiological effect upon the tissue for the same unit of concentration in the tissue. There is no reason why great advancement should not be expected, and it is my opinion that when it does come it must come along this line.

I am indebted for valuable references to Professor Morley, of the Western Reserve University, Professor Miller, of Case School of Applied Science, and Professor Herdman, of the University of Michigan.

Abstracts and Translations.

GUTTA-PERCHA.[1]

The variation in the specific weight of gutta-percha is explained by Payen[2] as due to its porous structure, which varies according to its treatment.

Payen distended softened gutta-percha under strong pressure. The strips thus obtained he cut up under water into small pieces. Most of these little pieces sank at once; others floated for a time, until they had absorbed water, and then sank likewise. It was concluded from this that gutta-percha was apparently lighter than water only because of its numerous pores filled with air, and that this porosity diminished in proportion to the care with which the gutta-percha was purified.

[1] Extract translated from Handbuch der chemischen Technologie.

[2] Journal für praktische Chemie, lvii. 152.

For the purposes of purification the crude gutta-percha is dissolved in chloroform or bisulphide of carbon; the clouded liquid is first filtered under glass and then allowed to evaporate naturally in a shallow vessel. After the evaporation of the solvent the gutta-percha remains in the vessel as a thin skin, which can easily be removed if the vessel is plunged for a time into cold water and water is applied at the same time to its contents.

Exposed to air and light, gutta-percha rapidly undergoes a change, which is probably due to oxidation, at the same time giving off a sharp odor. This change in the gutta-percha is especially rapid if it is exposed to the air at a temperature of from 25° to 30° C., in the form of thin plates, strips, etc., if it is frequently moistened, and particularly if it is afterwards dried in the sunlight.

By this process it becomes brittle, crumbles like resin, gains in weight, is more readily soluble in alkali and alcohol, and even becomes a good conductor of electricity, which it is not in its normal state.

W. A. Müller[1] and A. W. Hofmann[2] regard this change as determined by oxidation. The oxidized portion of gutta-percha is insoluble in benzine, melts only at 100° C., and is supposed to be contained in commercial gutta-percha in proportions as large as fifteen per cent.

The composition of oxidized gutta-percha is, according to Müller,—

Carbon	76.15
Hydrogen	11.16
Oxygen	12.69

Gutta-percha which has become brittle by the action of light or air can be rendered serviceable again for many purposes by softening it in warm water and remoulding it; but it soon exhibits a tendency to crack.

Gutta-percha remains almost entirely unchanged if it is covered with water, especially sea-water, or if it is protected from the action of light. The readiness with which it suffers change in the air or under the action of light-rays materially limits its employment.

Gutta-percha resists the influence of most solvents. Concentrated solutions of alkalies, salt solutions, and dilute acids, even hydrofluoric acid, have no effect; absolute alcohol will dissolve by

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[1] Chem. Soc. J., [2] iii. 273.

[2] Annal. d. Chem. u. Pharm., 215, 297.

boiling only a portion of those resinous bodies with their content of oxygen,—about fifteen or twenty per cent. According to Payen,[1] gutta-percha is only partially dissolved by ether. According to Arppe,[2] completely, especially if the ether is free from alcohol. Ether, to which some alcohol has been added, loses the property of completely dissolving gutta-percha. It is, however readily dissolved in bisulphide of carbon and chloroform, and, by the application of a mild warmth, also in benzine, the fugitive coal-tar oils, oil of turpentine, and the oils which are obtained from the dry distillation of rubber and gutta-percha.

The gutta-percha can be precipitated from a chloroform solution in the form of a white powder by the addition of ether. At low temperatures it is disintegrated by nitric acid, at the same time evolving a red vapor. Fuming sulphuric acid gradually imparts to it a brown tint; if longer exposed to the action of this acid, it swells and finally becomes a viscid mass. When warmed with sulphuric acid the gutta-percha at once becomes blackened, and suffers complete disintegration, carbon being separated from its other constituents. Strongly concentrated hydrochloric acid has but little influence on gutta-percha; only after being exposed to its action for a length of time does the latter become somewhat hard and brittle. The change which hydrochloric acid causes in gutta-percha has been observed in the gutta-percha tubes, which are used in drawing off the acid.

Gutta-percha is a poor conductor of heat and electricity: when rubbed against glass, flannel, etc., it becomes negatively electrified. Gutta-percha that has become grayish-blue by prolonged exposure to the air has, according to Riess,[3] the peculiar property of becoming positively electrified by friction. This superficial coating can, moreover, be removed by washing with ether or oil of turpentine; and if this is done upon one side of an old sheet of grayish-blue gutta-percha this side will be negatively electrified by friction with spun-glass or linen, while the other side when rubbed with the same substance will become positively electrified.

Under the polariscope gutta-percha exhibits beautiful color effects.

Pure gutta-percha is, like rubber, a hydrocarbon; indeed, both hydrocarbons are supposed to be isomeric. According to Sou-

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[1] Compt.-Rend., xxxv. 109; Jour. f. prakt. Chem., lxii. 243.

[2] Dingl. pol. Journ., cxxi. 442.

[3] Pogg. Ann., xci. 484; Dingl. pol. Journ., cxxvi. 115.

berain,[1] its formula is C_6H_{10}, corresponding to 87.8 of carbon and 12.2 of hydrogen. Souberain also found in crude gutta-percha a vegetable acid, extractive matter, and caseine, together with a resin, soluble in ether, and another resin, soluble in alcohol.

According to Müller,[2] the composition of commercial gutta-percha in one hundred parts is as follows:

Pure gutta	79.70
Soft resin	15.10
Vegetable fibres	2.18
Moisture	2.50
Ashes	0.52

From partially purified gutta-percha Arppe[3] secured six different resins, which showed a varying degree of solubility in ether and alcohol, according to the strength of the solvent and also according to the temperature. He arranged specific molecular formulæ for the different varieties of resin, but these are wholly hypothetical, as no compounds are known from which the atomic weights of these resins can be determined.

Payen[4] regards gutta-percha as consisting of three essentially different components. To these three substances he gives the names gutta, alban, and fluavil. They are supposed to occur in gutta-percha in the following average proportions:

Gutta	78 to 82 per cent.
Alban	14 to 16 per cent.
Fluavil	4 to 6 per cent.

Of these three substances fluavil is soluble in cold alcohol; alban is soluble in boiling alcohol, and gutta-percha is insoluble. In order to separate them from each other the purified gutta-percha is treated for several hours with boiling alcohol and then filtered. In the course of a day or two numerous white opaline grains separate themselves from the alcoholic solution, especially at the sides and on the surface. These little spheres contain an inner kernel (of a yellow, amorphous mass) which may be dissolved in absolute spirits of wine. The outer shell, on the other hand, remains insoluble, and, after repeated treatment with the spirits of wine, becomes

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[1] Journ. f. Pharm., 1847, 17; Dingl. pol. Journ., ciii. 415.

[2] Chem. Soc. J., iii. 273; Journ. f. prakt. Chem , xcvii. 380.

[3] Journ. f. prakt. Chem., liii. 171; Dingl. pol. Journ., cxxi. 442.

[4] Compt.-Rend., xxxv. 109; Dingl. pol. Journ., cxxvi. 115.

whiter and more transparent. By subjecting the granular mass to successive baths of cold alcohol, the fluavil is dissolved and the alban is left unaffected. When this has been separated by frequent boiling with alcohol, the final residuum is the gutta.

Fluavil is a yellowish, translucent resin, having a specific weight somewhat higher than 1. At 0° C. it is hard and inflexible; at 50° C. it becomes soft, at 60° C. it has the consistency of dough, and melts between 100° and 110° C. Under still greater heat it boils, and is finally decomposed, giving off hydrocarbons and acid fumes. It is soluble at low temperatures in ether, alcohol, oil of turpentine, bisulphide of carbon, and chloroform. When these solvents evaporate, it remains as an amorphous mass. It is not affected by dilute acids or concentrated alkalies, but is speedily decomposed by sulphuric or nitric acid.

According to Oudemans[1] its composition is—

Carbon	83.33
Hydrogen	11.11
Oxygen	5.55

corresponding to the formula $C_{20}H_{32}O$.

According to Oudemans, fluavil has been formed from the gutta by oxidation.

Alban forms a white, crystalline powder or even small grains. Under the microscope it appears as a series of transparent, radiating leaves. It begins to melt at 160° C., and becomes completely fluid without decomposition at 175° to 180° C.

In the presence of dilute acids and of alkalies its action is the same as that of fluavil; like the latter it is powerfully affected by concentrated sulphuric and nitric acids. In benzol, bisulphide of carbon, turpentine, chloroform, and absolute alcohol it is easily soluble; in ordinary spirits of wine it is soluble only at the boiling point.

Oudemans[2] considers alban as likewise produced by the oxidation of the pure gutta; he found its composition to be—

Carbon	78.9
Hydrogen	10.4
Oxygen	10.7

which corresponds to the formula $C_{20}H_{32}O_2$.

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[1] Rep. d. Ch. Appl., 1858 u. 1859, 455; Jahresber. d. Chem., 1859, 517.

[2] Loc. cit.

Heated to 130° C. it is supposed to lose a molecule of water and thus to become $C_{20}H_{30}O$.

Gutta, the principal constituent of crude gutta-percha, becomes at 10° to 30° C. tough, flexible, and distensible, but not elastic; at 45° C. it becomes soft and assumes a darker tint. As the temperature increases it becomes more sticky and translucent. Between 100° and 110° C. it passes into a condition like dough; and, finally, at 130° C. it becomes a thin fluid, begins to boil, and throws off, as products of distillation, an oil and gaseous hydrocarbons.

In the presence of acids, spirits of wine, ether, and chloroform it acts as gutta-percha does. According to Arppe,[1] gutta is insoluble in ether only when it has been previously treated with alcohol.

When heated with nitric acid, it gives osmic acid and hydrocyanic acid in large quantities; when pulverized, it absorbs oxygen; hydrochloric acid gas changes it into a brownish black mass, which, owing to contraction, has the appearance of having been melted on the surface. It is extremely subject to change and is very difficult to keep without decomposition.

Its composition Oudemans[2] found to be—

Carbon	88
Hydrogen	11
Oxygen	0

corresponding to the formula C_8H_5 or $C_{20}H_{32}$.

E. H. von Baumhauer[3] has corroborated Oudemans's investigations concerning the elementary composition of gutta, alban, and fluavil. According to his statements, gutta-percha consists principally of a substance free from oxygen ($C_{20}H_{32}$, which is identical with the formula determined by Oudemans for gutta), and incidentally of several substances produced from the gutta by oxidation. Of these he believes that he has demonstrated two with certainty, one with the formula $C_{20}H_{32}O$ (the same as Oudemans's fluavil), and another having the formula $C_{20}H_{32}O_2$.

The strong tendency of gutta-percha to suffer change by the action of air and light and to become soft at 45° C. is partially counteracted by vulcanizing,—*i.e.*, by mixing it with sulphur.

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[1] Journ. f. prakt. Chem., liii. 171; Dingl. pol. Journ., cxxi. 442.

[2] Rep. d. Ch. Appl., 1858 u. 1859, 455; Jahresber. d. Chem., 1859, 517.

[3] Journ. f. pr. Chem., lxxviii. 277.

Reports of Society Meetings.

AMERICAN DENTAL ASSOCIATION.

(Continued from page 588.)

August 3, 1897.—First day.—Evening Session.

THE meeting was called to order by the vice-president, Dr. Fillebrown.

The secretary read the minutes of the morning session, which were approved.

Dr. C. N. Peirce moved that the President's address be referred to a committee of five for consideration. Motion carried.

The chairman appointed Drs. J. D. Patterson, H. B. Noble, F. G. Dunbar, H. G. Burkhart, and Grant Molyneaux.

The secretary moved that the treasurer be instructed to pay all properly authenticated bills. Motion carried.

Section IV., Histology and Microscopy.

Owing to a delay in the report this section was passed for the time being.

Section V., Materia Medica and Therapeutics.

Dr. Cassidy reported that the section had a paper by Dr. Weston A. Price, of Cleveland, Ohio, on "The Physiology of Cataphoresis."

Dr. Emma Eames Chase, corresponding secretary, reported as follows:

At the request of the president, notices of this meeting were sent to each dental society and dental journal, calling attention to the importance of the meeting, and reminding each society that it is entitled to one representative for every five members, and asking that delegates properly instructed be sent to this meeting. Blank certificates have been mailed to all societies requesting them.

COMMITTEE ON UNION.

Dr. Fillebrown.—I wish to say that we have considered this subject, and have met with the other committee. The opinion of this committee is unanimous; they are prepared to present the report at the proper time, and I move that to-morrow evening the consideration of the report of this Committee on Union be made the first order of business. Motion carried.

Dr. Price then read a paper entitled, "The Physiology of Cataphoresis."

(For Dr. Price's paper, see page 647.)

DISCUSSION.

Dr. Rhein.—It has been a great pleasure for me to listen to the very able paper we have had on this subject. As far as my investigations with the cataphoric diffusion of medicinal agents have gone, they bear out entirely what the author of this paper has presented to us this evening. The only point of issue that I could perceive in what he has given us is the question of the means by which the medicinal agents are passed through the different substances,—whether it is by direct physical pressure or by the liberation of some of the molecular elements. I do not intend to discuss that portion of the paper, because it is necessary to follow it up by further investigations before the truth or the incorrectness of this theory can be established. I have been making some investigations along that line, although in a different channel, in order to produce, if possible, anæsthesia of the dentine and pulp by osmotic pressure, without the electric current; but I have not proceeded far enough to form any conclusions as yet. There is no question but what, if the pressure theory is a correct one, we will be able to obtain the anæsthetic effects by other means than by the electrical powers alone. It is the practical results that this paper has given us that interested me principally. I refer to the stress the author laid on the use of a milliampèremeter in cataphoresis. From investigations in different sections of the country as to the manner in which the different instruments were used, and the way in which they were endeavoring to sell them to the profession, I have learned that many men are trying to use this very valuable means without the use of a milliampèremeter. That cannot be too strongly condemned, for the excellent reason the author has given us. The other interesting point from a practical view is the ratio of data which he gives us from the numerous cases that he has so carefully observed, and the reading of those cases *seriatim* will certainly be of great interest to us. My own impression is that the solution of a reduction of the time limit resolves itself to a great extent in our ability to increase the amount of potential force that we introduce, and at the same time increase the amount of ampèrage that is forced through the tooth. I think the means of accomplishing that will be found in an improvement in the anode ends that are introduced into the cavity itself. I think the great mistake has been the use

of points too narrow for the diameter that was expected to be anæsthetized, which renders it ineffectual to diffuse a sufficient amount of current in a given space, and that the end of the anode should be as large as it is possibie to introduce in a given-sized cavity. This is the line which, if followed out properly, I believe, will enable us to reduce the time limit. We have all heard of the anæsthetization of dentine in a very few minutes, and whenever I have endeavored to follow up any such experimentation by personal investigation I have found that the amount of surface that was anæsthetized was not sufficient to produce complete anæsthesia, due very possibly to the imperfect cleansing of carious cavities that some of the profession is accustomed to.

Dr. Custer.—The paper is one which every one of us should look up when it appears in print. It is worthy of study and consideration, and is a monumental paper upon the question now before the profession as to the physiological action of cataphoresis.

Dr. Cassidy.—I endorse the stand that Dr. Price has taken with respect to the action of drugs cataphorically depending upon electrolysis. The point that struck me as rather novel in the paper, as proved by experiment, was that sensory nerves were poorer conductors than the muscular tissue, and that the nerve portion of a pulp is less affected by the current than the other constituents. In regard to the resistance between the two poles of the current, when there is a current passed between them those two points are poles no longer, and we take it for granted, it seems, thus far, that it is the anode or positive pole that must be presented in connection with the medicine.

If we wish to use cataphoresis in bleaching teeth, say with peroxide of hydrogen, and we want the full effect of the cataphoric action, instead of using the positive pole better results will be obtained by using the negative, because the hydrogen will seek the opposite pole. It will penetrate more and oxidize the substance causing the discoloration of the tooth more rapidly and more effectively than if the positive pole is used. The oxygen will not react any better than without the current until it receives a higher potential than the positive pole itself. The electrolytes, as the paper stated, must be compound in their nature, and must be in a fluid condition, in order to act. A mere solution of iodine is not a good electrolyte, but a compound of iodine with some element like potassium makes an excellent electrolyte. In such a case the laws of electrolysis are called into play. The iodine will go towards the positive pole, therefore the negative pole should be the one used

in connection with potassium iodide. You get better results from it. An element such as chlorine is not an electrolyte at all. It would be the water (if it be an aqueous solution) that would act. In using sulphuric acid to penetrate farther than by mere application, it is not the ion that affects the tissues. The sulphuric acid is decomposed, the sulph-ion (SO_4) penetrates, and it meets at the same time with the positive ion of water,—namely, hydrogen. What is the consequence? Decomposition of the acid by the electric current sets free hydrogen and the sulph-ion, SO_4. The hydrogen in a solution of that kind will escape at the negative pole, the sulph-ion at the positive, and when so escaping the sulph-ion takes up what hydrogen there is in the water and forms sulphuric acid, and acts on the tissues.

Dr. St. George Elliot.—I endorse all that has been said in regard to the very great value of this paper, for the reason that the gentleman who wrote it has taken the trouble to go very deeply into the matter. Most of us are quite satisfied to make practical demonstrations of certain theories, which we formulate in our own minds, and then we make certain practical applications of those theories; but there are very few of us competent to go into the matter as has the author of this paper; to properly discuss it we ought to read and study it and experimentally examine the facts.

Dr. Price.—I would like to say a word about the question that was raised, whether the nature of the electrodes would aid at all in shortening the time. The time is dependent upon the pain limit. It will not make a particle of difference what combinations we get in the circuit of a constant current; the same amount of current flowing through that nerve will produce the same result. I have had a man shut his eyes, and when I applied the current, he would tell me when a certain amount was reached every time, within the two hundred-thousandth part.

Adjournment.

(To be continued.)

THE NEW YORK INSTITUTE OF STOMATOLOGY.

A REGULAR meeting of the Institute was held Tuesday evening, June 1, 1897, at the residence of Dr. A. H. Brockway, No. 13 Greene Avenue, Brooklyn, New York. The President, Dr. George Allan, occupied the chair.

The minutes of the last meeting were read and approved.

COMMUNICATIONS ON THEORY AND PRACTICE.

The President.—I understand that Dr. Geran has consented to report upon an interesting case he has recently been connected with, and we will be pleased to hear from him.

Dr. J. P. Geran.—It affords me much pleasure to meet with the Institute this evening, and I appreciate the privilege of making a few crude remarks relative to a case of fracture that fell into my hands a few months ago.

The patient under consideration is the daughter of Mr. B., of Brooklyn. She is about ten years of age, and one of the prettiest little girls I have ever seen.

The accident occurred December 9, 1896, in the following manner: Leaving her home after luncheon for school, looking diagonally across the street she espied a playmate, and, eager to meet her chum, she started to run at a rapid rate. Nearing the opposite side of the street she fell, striking the curb-stone, lacerating the left side of the upper lip fully three-fourths of an inch, vertically, in two places, cutting through to the labial surface of the alveolus, crushing the bone, and destroying the gum covering both superior centrals and the left lateral. The right central was knocked out and afterwards found on the sidewalk. The left central and lateral, with a portion of the palatal surface of the bone and soft tissue, were driven backward and hung by the gum covering the roof of the mouth.

Dr. S. H. Benton, of Bergen Street, a skilful physician and surgeon, was called in, and, judging that dental assistance would be needed, he sent for me. The child was given an anæsthetic, and, after carefully setting the fractured bone and teeth in their proper places, I took an impression of all the teeth in the upper jaw, using a quick-setting compound. I did not think it advisable to use plaster of Paris for the impression, on account of the liability of the particles to get into the throat; and, again, as I really desired an impression of only about half of the labial surface of the four incisors, or just enough to hold them in, I concluded the compound was the better to use. Had the labial surface been covered, as well as the buccal surface of the posterior teeth, it would have been impossible to know positively that the teeth were properly in place within the splint. To be doubly sure of this, I made a small opening in the splint at the cutting-edges. After restoring the teeth to their sockets and occluding the inferior and superior molars, I found a considerable overlapping of the inferior

incisors by the superior, which enabled me to make the opening in the splint and do without a double plate.

The tendency in these cases, especially with children, after the bandage is on, and after becoming comparatively comfortable, is to make an effort to open the mouth, and if this can be done, which will readily be seen, the bandages can be tightened.

By making the plate with very little material between the molars and openings over the incisors, it enabled me to be sure of a good antagonism after removing the fixture.

After getting the model in shape, I followed the course that some text-books recommend,—that is, to burnish over the teeth two pieces of tin-foil, so as to enlarge the teeth, thereby allowing the splint to slip over them easily. This I found to be a mistake.

When I put the fixture in place I found it too loose, and had to warm the edges slightly and bend them in so as to bind on the molars in order to keep it in place, especially while the patient was under the anæsthetic and until we could get the bandage on. The splint was not allowed to extend over the molars beyond the free margin of the gum.

As both the superior and inferior deciduous cuspids and molars were lost in the accident, it allowed me to curve out the plate sufficiently to have a space to administer nourishment and disinfectants. This is another reason why I could make the splint thin, or, in other words, have very little vulcanite between the masticating surfaces.

Concerning the surgeon who had the case in charge, I will say that in a matter requiring so much delicate manipulation I would not wish to be associated with a more competent and gentle man than Dr. Benton has proved himself to be. While it was the occasion of our first meeting, the experience has caused me to be thoroughly satisfied that if there were a more friendly and fraternal feeling existing between men of the two professions, it would be to the advantage of both, and more especially to our patients.

I have asked Dr. Benton to add a few notes on this case, and he kindly sends me the following:

"Dr. Geran has asked me to add a postscript to his paper to be read before your society to-night. I take it that there is very little to add that the doctor has not already touched upon, and I know how prosy it would be for all to listen to a repetition on the same subject.

"Dr. Geran will doubtless give a history of the anatomical

lesion from the stand-point of the dentist, and my notes will be principally surgical.

"When I first saw the child she presented a frightful appearance. After cleansing her face I found an extensive laceration of the labial tissue in all directions, which did not promise well for her future appearance.

"On examining the mouth I found what appeared to be the whole of the left upper jaw driven back almost to the palatal arch and broken into several pieces, leaving the roof of the mouth almost denuded, with one or two teeth lost. I realized at once that I must have a splint made by a dentist if I hoped to get anything like a satisfactory result.

"Dr. Geran kindly came to my relief. After the splint was made, which required about eight hours to get satisfactory, I adjusted the fragments, which we found difficult to keep in place, and Dr. Geran deftly adjusted the splint; I immediately repaired the soft parts. The whole time for dressing this injury extended from 1 to 11 P.M. One of the teeth was out all this time and returned to its place at the final dressing by Dr. Geran.

"The gum and bone over the front teeth were cut off or lost in some way, but at this writing are almost fully restored. The teeth seem to be solid, are even, and in every way as satisfactory as before. To keep the splint in its proper position I improvised, after many trials, a head-piece attached to a splint on the inferior maxillary, making even pressure along the whole course of the jaw. This was kept very tight, so there was no movement of the jaw whatever. The after-treatment was on general principles of cleanliness.

"I could not hope for the results which were attained without just the measures that were used. This case has seemed to create some interest in dental circles, and I trust Dr. Geran will be accorded the credit for the satisfactory results.

"I am glad that we have men in the dental profession who can go out of the usual routine of dental work and be of such great assistance to the surgeon.

(Signed) "S. H. BENTON, M.D."

Dr. Geran.—I tried this evening to procure a lower maxillary splint to show here, like the one used in this case, to hold the jaws firmly together; but as they are not kept in stock I was unable to do so. The one used for this case was made to order, and was so arranged as to do away with the old method of covering the entire

head and part of the face with three or four yards of muslin bandage.

Dr. S. E. Davenport.—Would Dr. Geran be willing to give us a description of the teeth of the little girl as they were when he last saw her?

Dr. J. P. Geran.—I saw her yesterday, and the restoration or deposition of new bone and gum covering the labial surface of the teeth was remarkable.

I would like to state that, in my hurry when I was called to her residence to see the condition of things, I forgot to put the tooth which was knocked out in my pocket before I returned home to get my impression materials. Had I done so I would have removed the pulp, but it did not occur to me until after I returned to take the impressions. However, I thought I would put it in and trust to results. As already stated, the teeth grew fast, nearly covered with the bone and gum; but a few days ago the patient came to my office, and upon examining her mouth I found a fistula over the right central,—the tooth that had been knocked out.

I made an appointment with her for yesterday. She is a very timid little girl, and I asked the father to come with her and I would remove the pulp. I did so.

The left central and lateral that were dislocated and which hung by the gum, also the right central that was entirely out, are in an apparently healthy condition,—no discoloration whatever.

Dr. C. A. Woodward.—I have a little object-lesson which I wish to present that may be of service to young men, or to careless operators, as I presume there are some in existence. It is a case of two superior bicuspids that had porcelain crowns put upon them. The root of the one I hold here, as will be seen, is quite large and perfectly straight, but still the canal made for a Bonwill crown was drilled through the root, and the screw which was inserted passed through that opening into the soft tissue, and was in that position for three years, to the great discomfort of the patient. She told me there has been scarcely a month during the three years that she has not been to the dentist, who put on the crowns, for the treatment of those teeth. When I examined the case I found that one root had been perforated, and I made up my mind to extract both roots. The whole plate of the alveolar process was found to be destroyed, and still it had been treated for three years, and the dentist had hopes of curing it, which I cannot understand. In selecting teeth for implantation I chose as long roots as I could obtain, but not being able to get much of a hold in the process, as

so much of it had been destroyed, I am in doubt about their success, although the operation was performed about six weeks ago, and the teeth are pretty firm. She says she has been able to masticate upon them, but I warned her about using them very much at present, as the hold is not sufficient. This work was not done in a so-called "dental parlor," but by a man who for years has prided himself upon being a very rapid operator.

Dr. J. W. Russell.—I have here the cast of a case which came into one of our hospitals this spring. She was a young lady, about twenty-two years old, who had had a great deal of trouble on one side of her face for about seven years. There was a lump there, and it kept growing larger and larger. I made a diagnosis of dentigerous cyst. Not being on the staff, I could not operate on the case, but I was present at the operation. There was nothing found in the cyst. It ran forward almost under the central incisor. The cavity was about three-quarters of an inch deep. It was opened, and the parts pressed together and packed, and it is now almost well, after about three months.

Dr. F. Milton Smith.—I have some very thin finishing strips that have been useful to me, and I have brought them along as samples. I suppose many of the gentlemen have used them; they are made of architect's tracing-cloth. In finishing amalgam fillings, before the amalgam is set, they are extremely convenient. I have also found them convenient for polishing. I get a yard or two of the architect's tracing-cloth, which may be obtained at most stationers', and get my printer to cut it for me. I have never come across anything as thin as this material with as much strength.

The President.—May we now have the pleasure of hearing from Dr. Dawbarn?

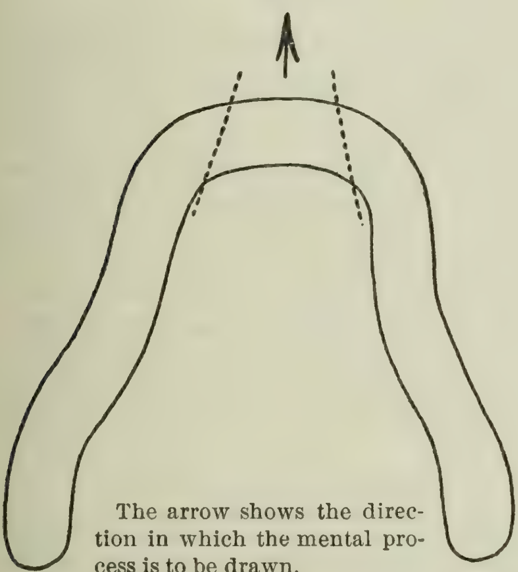
Dr. R. H. M. Dawbarn.—This is a rather premature report, for which I must apologize, but it is made at the request of Dr. Bogue. I hope to make a fuller one later on, accompanied with photographs of the abnormal condition, together with casts of the jaws and photographs of what results I may succeed in obtaining. The patient is a child of thirteen, daughter of a prominent Spanish family in Brooklyn, a patient of Dr. Hanning, and was referred to me for the surgery in the matter by the courtesy of Dr. Parker and Dr. Gage. There are two absolutely distinct conditions, and at least three operations of a surgical nature are necessary. The first is for enormous tonsils, so large that they nearly meet in the median line, and the pharyngeal lymphoids almost fill the pharynx. A doctor here in town has treated the child for some time with

douches for catarrh, and did not pay attention to the fact that it was caused by this trouble, which between five and ten per cent. of children have in this climate. It is a common cause of high arching of the palate. The child is a mouth-breather, and, like most mouth-breathers, anæmic. I have removed the tonsils and cleaned out the pharynx thoroughly, and as soon as she is well I will treat her for the trouble about which I want to speak this evening. When she was about three or four years of age she had a severe attack of scarlet fever. I cannot get the exact details, because her present family doctor is not the one they had at that time. In consequence of that attack of scarlet fever severe necrosis of the lower jaw on both sides occurred, resulting in a sequestrum, which was cast off on both sides, consisting of the entire body of the lower maxilla, with the exception of the genial process and the two rami. The result shows, however, that the periosteum could not have been destroyed, because bone has been reproduced. There is a solid jaw, the normal ramus, and the normal genial process, and new bone formed from the periosteum which was left; but the periosteal cavity must have fallen in as far towards the tongue as the tongue would permit, as there is a distinct hollowing on both sides. All the teeth were lost, except in the region which was not attacked, which contains a set of seven teeth,—three incisors, two canines, and two bicuspids. Because of the other trouble, the narrow, high arch of the jaw, the upper front teeth project, and they project even more noticeably than they otherwise would because the chin recedes. Not only did the lower jaw fall in on each side, but, there being no support to the chin, the chin fell backward, so that the child's upper incisors protrude two-thirds of an inch beyond the incisors of the lower jaw. She has rather fat cheeks, and that makes still more striking the deformity on each side, because the scars in the regions from which the bone was removed have grown to the bone, making a deep depression on each side. The result is hideous in a child who would otherwise be beautiful, having large, dark eyes and expressive features.

Now, the problem that presents itself is what to do for the deformity on either side of the soft parts, and what to do for the lower jaw. I will tell what I contemplate doing, and then ask for suggestions. I propose to dissect out the scar and free it from the bone; but, with the tendency of scarred tissue to contract, I fear it will sink down again, and I contemplate at the time of the operation, before I absolutely finish the stitching, to inject into the cavity beneath (there will be a space of nearly an inch) freshly

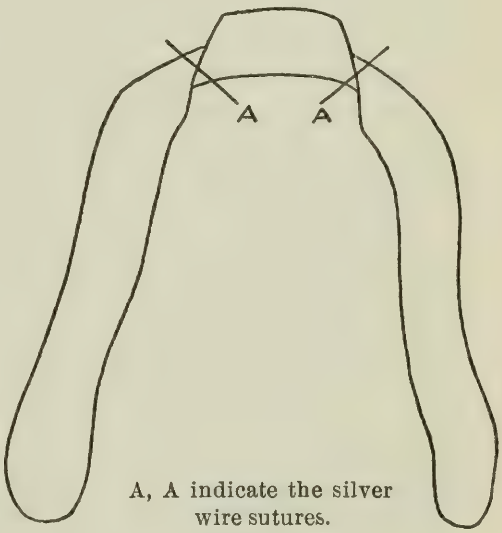
melted and sterilized vaseline as a partial support for these soft parts, and to prevent the scar reuniting to the bone. I have not done that in a similar case, but it is a standard treatment among surgeons at this day in certain cases of suppurating bubo. It is customary to squeeze gently or scrape out the contents through an incision only one-fifth of an inch long, and then fill the cavity with melted vaseline and five per-cent. iodoform, and put on a compress. The vaseline and iodoform mixture is absorbed and its place taken by connective tissue. We know, however, that the pus in buboes is not infrequently sterile,—that is, different from other pus in not containing microbes. When the child has recovered from those two operations, the question will arise whether we can do anything for the sinking in of the body of the jaw and the recession of the mental (genial) process,—whether I can bring that chin in some sense forward so that the teeth will more nearly articulate with the other jaw, and whether I cannot widen the lower jaw.

Fig. 1.



The arrow shows the direction in which the mental process is to be drawn.

Fig. 2.



A, A indicate the silver wire sutures.

This sketch indicates roughly the shape of the body and mental process of the lower jaw seen from above, the sinking in on either side being quite noticeable. I have indicated roughly what would be the position of the teeth, and what I contemplate doing is, with a slender saw, sawing along these black lines obliquely so my saw-cuts will be wider apart at the back than at the front, and, following the direction of this arrow, driving that detached mental portion forward and then suturing with silver wire. I will bring the chin more prominently forward in that way, and, because the bony

wedge thus formed is wider at the back than at the front, I will inevitably have separated the two sides to a noticeable extent. By suturing that as aseptically as I can with silver wire, I ought to get union, the same as in a simple fracture of the jaw. I would like the opinion and suggestions of the gentlemen present as to that technique.[1]

Dr. Houghton.—Is the contour of the upper lip normal?

Dr. Dawbarn.—Practically so; the mother has kindly consented that the photographs that I have taken, and those to be taken later on, may be shown to this society.

The President.—Does Dr. Dawbarn know the relation existing between the lower jaw and the upper jaw as to width?

Dr. Dawbarn.—The lower jaw is distinctly narrower, just how much I cannot state exactly,—maybe one-third of an inch on each side.

The President.—What effect will that operation have on the soft tissues,—on the chin, for instance?

Dr. Dawbarn.—There will be some little tension at first, without any doubt; but that will stretch.

Dr. Cook.—Does Dr. Dawbarn expect any change in the bony structure of the jaw after the operation is performed?

Dr. Dawbarn.—No, sir.

Dr. Cook.—And the space between the present condition of the bone and the surface of the cicatrix, after it is healed, will be filled with connective tissue?

Dr. Dawbarn.—Yes, and I do not think there will be any scar. She has had always since that time of scarlet fever a little discharge on the left side, with perhaps a drop of pus every two or three days, to be washed away. That, on being probed, leads to the

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[1] At the date of going to press Dr. Dawbarn reported that he had now operated upon the two cheeks, as intended, reserving the operation upon the mental process until later. Dr. Dawbarn states that the operation upon the left cheek showed that he was wrong in thinking that the continual mucopurulent discharge from that point indicated a remaining piece of sequestrum. Upon chiselling into the body of the bone he discovered a large, perfectly developed, first molar tooth, lying in a little chamber entirely surrounded by dense bone. The tooth was so placed that its crown was directed inward towards the tongue, and its root outward towards the cheek. From the membranous sac surrounding it and lining this little chamber came the discharge, at one delicate point, of a cloaca, which had continued all these years. It is evident, from the presence of this tooth, that at least a little of the natural bone on this side, containing this tooth-germ, did not die, and came away with the rest of the sequestrum.

interior of the new bone. Evidently there must have been an old sequestrum, which has never been removed, having become surrounded and held by the involucrum. The latest theory is that it is the carbonic acid of the blood which has the power to dissolve dead bone and thereby separate dead bone from living bone. I shall have to chisel in and remove the dead bone and sterilize the cavity with peroxide of hydrogen before suturing the soft parts.

The President.—Will Dr. Dawbarn kindly sketch what would be the outline of the other jaw in relation to this?

Dr. Dawbarn.—Yes, sir; something as I now indicate.

The President.—Is it Dr. Dawbarn's intention to spring out these two parts in the direction shown?

Dr. Dawbarn.—Yes; when the central portion is brought forward the sides will separate in the directions I have indicated. As to drills, for the wire suturing, the best bone-drill is an ordinary ten-cent awl for most bone-work,—not dental. I could go in between the central and lateral incisors and cut more obliquely and get greater lateral width; but I do not know whether it would be wise to do it. It would make a very narrow mental process.

Dr. Russell.—Would there be any objection to making a partial fracture at each side, too, and bending the body of the bone outward there, thus adding to the width of the lower jaw?

Dr. Dawbarn.—There would be four fractures in the jaw then, and I would be afraid of a lack of union.

Dr. Brewster.—Is there any evidence of nerve-supply to the inferior teeth at the present time?

Dr. Dawbarn.—I wish I could answer that. I will make it a point to inquire, so I shall know at the next report of this case. It would be strange if there were such nerve-supply, because the inferior dental canal must have been carried away with the dead bone. It is a very interesting point, and brings up the further point whether this bone, having had its nerves destroyed, might heal with difficulty after operation, or whether, on the other hand, it may have gotten a new trophic nerve-supply from other sources.

Dr. Howe.—As this very interesting case involves necrosis, I would like to ask a question,—namely, Whether necrosis ever exists without separation of the dead from the living, thereby causing sequestra, and whether it ever takes place without suppuration? The question has a bearing upon the common statement that the borders of the alveolar processes are necrosed when pyorrhœa alveolaris exists. A case in which I was consulted recently, involving an opening into the antrum, also had that question as a

factor in the diagnosis and treatment. There was an opening into the antrum from previous suppuration, at the apex of the root of a second bicuspid tooth. The root had been removed and the opening through the socket of that tooth into the antrum was the full size of the root of the tooth. There was a clear opening into the antrum, and yet a surgeon proposed to make another opening, higher up, towards the malar bone, on the ground of necrosis, which would require the cutting away of dead tissue. There was, at the time, no suppuration, and I did not acquiesce in the opinion that necrosis existed. There has seemed to me to be sometimes confusion with regard to the signs of necrosis, and I think Dr. Dawbarn will help us to a clearer understanding of what necrosis means.

Dr. Dawbarn.—I have never heard or read of a case of necrosis in general surgery without suppuration and without ultimate reparation of bone. The usual period at which a surgeon expects that dead bone will be loosened is three months. Sometimes when he goes into the foramina that are left by nature (cloacæ) with his probes, he does not find the bone loose, because it may be so held by the granulations that he cannot move it; and yet at the end of three months he chisels down to free it, feeling pretty sure that he will find it detached at that time from the living bone. It may, perhaps, be interesting to allude to modern methods of operation upon such cases in general surgery for a few minutes.

First, I will speak of Neuber's method, or "method of deep canalization." Suppose we have a superficial necrosis of the shaft of the tibia. The granulations all being scraped away and the surface chiselled smoothly and made sterile, a skin-flap is freely dissected up on either side until, without more than very slight tension, these flaps will meet at the bottom, and are fastened to the bone with sterilized nails. If the stretching is not too great, the skin will grow to the subjacent parts, and at the end of a week or ten days the nails can be removed, and the patient is cured. although he has a very deep dimple there; but there is a constant effort on the part of nature to bring that depression up to the surface, and at the end of a year the dimple is a small one, and finally it will disappear altogether.

Secondly, I will allude to the technique of Schede. This is "healing under the moist blood-clot." The cavity is made smooth and absolutely sterile as before. Then a sheet of sterile gutta-percha is placed over the wound, and this is in turn covered with sterile dry dressings, and then a plaster-of-Paris splint encases the

limb. Not until then is the rubber tube encircling the thigh removed; whereupon the blood from the small vessels of the bone promptly runs into that cavity and fills it entirely with a solid clot; which last serves as a support, nutriment, and basis for a wonderfully rapid healing process.

Another method is that of Thiersch. Having prepared the cavity thoroughly and destroyed the pus-microbes with peroxide of hydrogen, and got an absolutely smooth surface, we take off skin-grafts, with a razor, from the thigh or elsewhere, covering that bone with such grafts, which will grow to the bone. The bone itself exudes plasma sufficient to nourish them. They generally live as when grafted on normal soft parts, and in about ten days you have that cavity skinned over.

Another plan is that of homogenetic bone-grafting, removing the granulations and perfectly sterilizing, and then filling in the space with the method that Nicholas Senn, among others, advocates,—*i.e.*, with decalcified chips of bone, which do not become revived, but they act as a nutritive material in which connective tissue forms with great rapidity, that connective tissue ultimately forming into bone, so that the cavity will thus commonly heal more quickly than by the old-fashioned method of packing with gauze and waiting for granulations, which takes often months to accomplish, and following which comes slow cicatrization.

Another method is filling with chips of natural bone. Chiselling thin chips lengthwise from the patient's healthy tibia, and then putting them in side by side until the cavity is filled and those are not expected to live, in quite a large percentage of cases being nourished by the vitalized plasma exuding from the raw bone.

The sixth modern method is the heterogenetic method, and probably the most interesting to dentists,—namely, to make use no longer of the idea that the bony cavity will be filled with healthy tissue, but to fill it quickly with something foreign and non-vitalized, like gold fillings in the teeth. Having sterilized the cavity and made undercuts, line it carefully with (for example) gold-foil, and then fill it with plaster of Paris and have it set, and then dissect up a flap on either side and bring the edges together and suture them. That has repeatedly been done, especially in Germany. Of the ultimate results it is too soon to speak positively. There have been more failures thus far than successes, but it is certainly an interesting line of work.

Dr. Elliott.—Before we pass the question of necrosis, I would like to say that I have a rather interesting case of a lady who has

had a great deal of neuralgic trouble with a left lower molar. I finally advised her to have it removed. She went to one of the specialists and had the tooth taken out. This gentleman told her that she had necrosis of the jaw, and immediately commenced with a bur to cut away the necrosis, the result being that he cut the inferior dental nerve, causing paralysis and a great deal of trouble. Many years ago, in operating on a similar case in London, I noticed this practical difficulty, that in attempting to bur out dead bone the sense of touch was not sufficiently acute to inform me where I left the dead and struck the living. I finally had to wait until the exfoliation occurred.

Dr. Shaw then read a paper entitled "The Preparation of Dental Alloys and Cements."

(For Dr. Shaw's paper, see page 634.)

DISCUSSION.

Dr. Brockway.—Do the materials deteriorate by age or exposure to the air?

Dr. Shaw.—Yes; the oxide of zinc sometimes changes to carbonate, and I think it would be better to prepare a small portion of liquid at a time.

Dr. Russell.—I have tried for many years to make different amalgams. The apparatus Dr. Shaw describes is too elaborate for the ordinary dentist. All text-books teach that the silver should be melted first. A glass furnace is not needed. The tin will carry down the other metals. The lower the heat at which the alloy is melted the more quickly it will set, and it can be melted at the melting-point of tin. I have made an alloy of tin and platinum over a Bunsen burner, so it is hardly necessary to have a plumbago crucible and a glass furnace.

Dr. O. E. Houghton.—I attended the meeting of the New York State Dental Society this spring, at Albany, where Dr. Black was the chief attraction with his amalgam experiments. One of the experiments was with tempered amalgam. The experimenter was Dr. Butler, of Buffalo; and Dr. Butler, at the request of Dr. Black, gave his experience before the Society of how it worked, and the results. The amalgam used, I believe, was one of Dr. Black's favorites,—about 68.5 silver, 25.5 tin, 5 gold, and 1 zinc. This amalgam was in an ingot from which he filed off a portion and divided those filings into two parts. Of one portion he immediately made an amalgam filling and inserted it in one of the steel disks which Dr. Black uses for testing. Dr. Butler stated that he

had all he could do to get it into the disk before it got hard. He used equal parts in weight of mercury and alloy. That filling showed, under Dr. Black's tests, very little change or contraction forty-eight hours after, and proved to be one of the best fillings tested. Dr. Butler then took the other portion of the alloy, tempered it with boiling water, and mixed it with fifty per cent. in weight of mercury, the same as before; he stated there was a great excess of mercury, and he had to keep squeezing it out for a long time. He found this filling very slow to harden. This filling was tested by Dr. Black forty-eight hours after, and the contraction was found very great, in fact proved one of the worst fillings tested by him. It was spoken of as a very queer thing.

Dr. Brockway.—The inference would seem to be that—allowing time to manipulate it—the quicker the amalgam set the better would be the results. If any present have ever used palladium for filling, they will realize that it sets very rapidly,—so quickly that it is difficult to use it in some cases. A considerable quantity of heat is evolved in the operation of setting, so that a mass sometimes explodes; but it makes an admirable filling, so far as the joints are concerned. I never saw an amalgam that made such perfect joints as palladium does, and were it not for the difficulty in manipulating it, and its great cost, I think it would be in general use.

Dr. Houghton.—I have had so much experience in making oxychlorides that I am led to differ with Dr. Shaw in relation to the deteriorating of aged zincs. I find that the older it gets the slower it sets, but it sets just as hard. If the powder part is three or four years old, it sets three times as slowly as when freshly made, but that could all be restored to its original condition by recalcining and grinding it again.

Dr. Howe.—I feel very glad that Dr. Shaw has presented this subject, for I think it is very desirable that we should know more about the materials we are so constantly using. I am sure there are many dentists throughout the country who would like to make their own alloys, and learn by practical experience the differences in the various formulæ. We are greatly indebted to Professor Black for the information he has given us, resulting from the exhaustive experiments he has carried on; but there is much more for us to know on this subject. Dr. Houghton's remarks in regard to the oxychloride of zinc, recalled to my mind the need that some of us have for slow-setting oxychloride for the filling of root-canals. The filling of these canals with this substance can only

be accomplished properly when the cement sets slowly. I would like to ask Dr. Houghton to tell us what, besides aging, will make oxychloride cement set slowly. He has told us that the old powder sets slowly, and how it can be restored to quick-setting; but how can we make that which is quick-setting set slowly?

Dr. Houghton.—I must say that has been a matter that has bothered me a great deal. I have succeeded at times and I have failed at other times. It can be done by using various grades of oxide of zinc and manipulation in calcining. I have found in making the best oxychloride that only a percentage of snow-white French zinc should be used. American zinc, which was full of many impurities, was used in making "os artificial" mostly. It contained oxide of iron and various other oxides, and it could not be calcined very long without turning it yellow. The French zinc could be calcined three or four hours and come out perfectly white. I have found that the oxide of iron would produce a beneficial result sometimes in cements in making them set harder. There are as many little freaks in its manufacture as in oxyphosphates, and one must have much experience and tact to have it come out right every time. Hardly two samples of oxyphosphate, even from the same manufacturer, will be exactly alike; but if one gives it his attention, he can get it pretty nearly right each time. Its manufacture is generally left to some assistant, and there is a great deal of carelessness in making it. There is need of a white oxychloride for lining teeth after bleaching and for teeth that are partly discolored, and a slow-setting oxychloride for root-filling. I have thought seriously of bringing out some such preparations, although I have done nothing in that line for nearly twenty years, except for myself and some of my neighbors.

The President.—I will call upon Dr. Howell.

Dr. Howell.—The subject of splints was mentioned to-night, and I presume many have had the trouble I have of not having a flask deep enough. The ordinary flask is generally much too shallow, and I have designed this one, which I take pleasure in showing, with an extra ring to increase its depth. As will be noticed, it can be either an ordinary flask or one of extra depth. A lady had two broken toes, and the physicians could not regulate them unless they had a rubber splint, which I was called upon to make, this flask proving very useful.

Adjourned.

S. E. Davenport, D.D.S., M.D.S.,
Editor The New York Institute of Stomatology.

ACADEMY OF STOMATOLOGY.

A REGULAR meeting of the Academy of Stomatology was held in the rooms of the society, 1731 Chestnut Street, on April 27.

The proposed amendment to the constitution—viz., that the council of the society shall consist of six instead of five members, as heretofore—was voted upon and passed.

Dr. Thomas called attention to a deficiency of the subscription-list for the placing of an heroic bust of Dr. Horace Wells, the discoverer of anæsthesia, in Washington, D. C. Although the appeals to the profession at large for subscriptions had met with a prompt and generous response, the sum total is still insufficient to provide the proposed memorial. Other dental societies, as well as the dental fraternity in general, had subscribed, and Dr. Thomas urged that the members of the Academy subscribe again to so worthy an object as perpetuating the memory of one of the world's greatest benefactors.

The Clinic Committee reported an exhibition of a case by Dr. Louis Jack, upon whom he had performed two operations in the same mouth, which might be fittingly termed the reimplantation of teeth.

Dr. Jack.—The case herewith presented is one in which correction of a deformity and cure of a diseased condition have been accomplished by means of radical surgical measures. The case is described in my paper upon "Plantation of Teeth," *Proceedings of the Academy of Stomatology*, December, 1895, as number two of the replantation cases. (See INTERNATIONAL DENTAL JOURNAL, vol. xvii. p. 139; also *Dental Cosmos*, vol. xxxiii. p. 189.)

The patient, a female. About three years before, the upper incisor teeth fell victims to phagedenic pericementitis. The disease began in the lateral incisor of the right side, and subsequently the central incisors became involved; following upon this the left lateral incisor has become displaced.

The early clinical stages of the disease change in the positions of teeth; what is known as voluntary tooth-movement affected markedly the right lateral incisor to an extent productive of positive deformity, the malposition of the central incisors being not so marked.

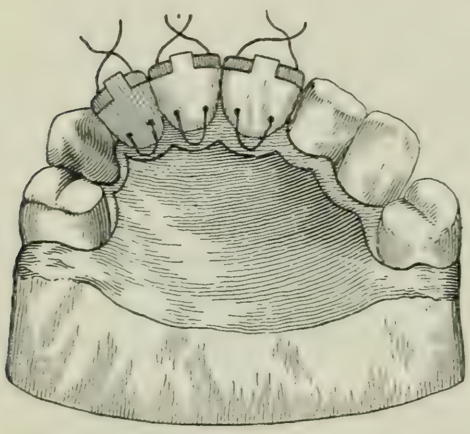
As a means of correction it was contemplated and advised that the affected teeth be removed and replanted in their normal positions. To this the patient demurred, but consented that the operation be performed upon the tooth most out of alignment,—viz., the

lateral incisor. As there was evidence of disappearance of a portion of the partition of bony tissue between this incisor and the adjoining central incisor, it was urged that the operation be performed upon both teeth, to which the patient would not assent.

She was etherized, the lateral incisor was extracted, its canal cleansed and filled with gutta-percha, and placed in an antiseptic solution. The existing abnormal alveolus was extended at its lingual aspect, and deepened, until by measurement it was shown that it would permit the placement of the tooth in correct position,—that is, virtually, although the tooth was replanted, a new socket was formed, so that the operation actually resembles implantation. The sterilized tooth was placed in position and retained immovably by means of a fixture for a period of six months, when the tooth was found to be perfectly firm in its new socket, and upon percussion exhibited normal resonance.

The malposition of the central incisors became so marked that operation upon them was deemed imperative. By this time the pocket upon the distal wall of the root of the right central incisor was extensive, exhibiting a loss of at least a portion of the adjoining wedge of alveolar process. The roots of these teeth were immersed in a dilute solution of hydrochloric acid (after the method of Dr. Amoedo), but not carried to the extent of decalcification advised by him, the purpose being to remove any minute deposits of calculi which had escaped detection, as well as to soften the cementum which had become exposed by the extension of the teeth.

The retaining appliance (see illustration) consisted of a narrow gold plate clasped to the bicuspid teeth ; a tongue of the plate extended over the lingual face of the replanted tooth, through which two holes were drilled near the neck portion ; an extension of the tongue, as shown, was carried over the cutting-edge of the tooth. Through the openings a fine platinum ligature was passed, and the teeth were lashed to the plate to maintain their position laterally. The illustration shows the fixture adapted to the retention of three teeth.



The splint for the fixation of the lateral was kept on for six months, but in the case of the centrals, at the end of four months

the teeth were found firm in their sockets. Upon percussion the teeth exhibit normal resonance, except the right central incisor, that in which the degenerative changes accompanying phagedenic pericementitis were marked; this tooth responds with a dull, flat note when tapped, indicating an inferior density of the surrounding tissue in comparison with the two other replanted ones.

The gum festoons about the necks of the teeth exhibit a normal appearance, there being no evidence that the teeth have undergone operation. In addition, the crowns of the teeth are translucent, appearing as though they contained vital pulps.

The remaining lateral incisor is now involved, which will necessitate, in the near future, operation upon that tooth also. This operation is of interest as exhibiting the possibility of radical relief in the early stages of phagedenic pericementitis before atrophy of the alveolar walls occurs.

DISCUSSION.

Dr. Guilford.—I examined the case, and think it a pronounced success; the teeth are firm, and there is no evidence of operation upon the crowns or the roots of the teeth.

Dr. Roberts.—What is your opinion, Dr. Jack, of the mode of union in these cases?

Dr. Jack.—Histological data are deficient in this connection, but, combining such data as we have with reasoning upon pathological and physiological teachings, it appears to approach in nature an encystment, having the characteristics of ankylosis.

Dr. James Truman arose to a personal explanation. At a former meeting his remarks on Dr. Williams's slides were misinterpreted, and were made to appear as in opposition to Professor Miller's views on dental caries. Such interpretation was not warranted by anything then stated, and was widely at variance from his own views. His criticism, at the meeting mentioned, was confined entirely to two or three slides in the collection. The preparation of these, as well as all exhibited, was beyond criticism, but the deductions sought to be drawn from them were not, in his judgment, correct. He then proceeded to give his ideas in a manner to avoid misconception.

The President.—The papers of the evening are now in order,—the essay of John Girdwood, D.D.S., L.D.S., Edinburgh, Scotland, upon "Root-Perforation: A New Method of Treatment," and a short report by Dr. Henry C. Register upon "Some Features in Bridge-Work."

(For Dr. Girdwood's paper, see page 357, and for Dr. Register's paper, see page 641.)

The President.—These papers are now open for discussion.

Question.—Why should paraffin not be used for this purpose? Certainly it is, theoretically, an applicable material.

Dr. Inglis.—I have used paraffin for perforation near the apex of the root. It has the virtue of easy removal.

One difficulty of treating these cases of perforation near the apex is the sterilization and filling of that portion of the canal which lies beyond. There is always a doubt as to the condition of this apical portion of the canal. The first thing to do with a perforation is to diagnose it. The cases that I have seen have occurred in consequence of the lateral cutting of reamers which were not held in the axis of the tooth. A fine probe passed towards the apex causes pain and immediate hemorrhage. I have pursued the following method: A gutta-percha cone is introduced, and its point cut off, until no sensation is produced, when it is placed in the canal. This is coated with thick chloro-percha, and slowly but fully introduced; however, it had better be too short than too long.

For the large lateral perforations I use a plaque of gutta-percha. In one case of perforation with an external fistula overlying it, I pressed back the soft tissue, exposing the perforation through the gum; then placing a gutta-percha cone in the canal, I treated the perforation as a cavity,—filled it from the exterior with facing amalgam. The wound healed, and the tooth is now doing good service.

Dr. Darby.—My son had a case closely analogous in its relations to perforation of the root. A boy, aged eleven years, fell and drove his central incisors out of position. The teeth were replaced in position and held firmly until healing occurred. The pulps of the teeth which had been devitalized by the accident were removed, and it was found that the foramina were of immature size. I suggested that the canals be reamed to the size of the foramen; then, by measuring the exact distance from the floor of the pulp-chamber to the apex of the root, a gold wire was placed in the latter, and a shoulder made by cutting away the wire to the diameter of the reamer employed; the thinned portion was then cut off and the end rounded until it exactly equalled in length the length of the canal, the shoulder engaging and resting upon the floor of the pulp-chamber. The wire, dipped in thin chloro-percha, was placed in position and served as the canal-filling.

I want to sound a warning as to the use of copper amalgam.

Placed in the crowns of pulpless teeth, it will certainly discolor the crowns if no impermeable layer be interposed between the filling and the dentinal walls.

Dr. Register.—It does not discolor roots in which it is placed.

Dr. Darby.—It will be discolored whenever placed in such situations as the decomposition of albuminous matter is found; wherever hydrogen sulphide is formed copper amalgam will discolor, and it very frequently is formed in pulpless teeth by the decomposition of the organic contents of the dentinal tubuli.

Dr. Truman.—There is one phase of this matter which is not receiving the attention it should in our discussion, and that is the condition of the parts as regards sepsis. The older the perforation the greater is the difficulty of producing sterilization, and until perfect antisepsis is attained, we must consider the danger of degeneration of the vascular tissues about the parts. The difficulty of successfully treating lateral perforations is greatly increased if the parts are permitted to become or remain in a septic condition.

Dr. Register.—The best treatment for perforation is the preventive treatment. If in reaming canals we perform the operation very carefully, it will be found that, as the instrument approaches or touches the cementum, the patient will give evidence of pain; if the patient be previously directed to state when sensation occurs, perforations should never occur. When I find that the instrument (the reamer) has invaded the cementum, I sterilize the canal thoroughly, and am careful to exercise no pressure in placing the root-filling.

Those cases of perforation near the apex which I have encountered I have treated after one method. Packing in the canal, and against the pericementum at the perforation, a small quantity of salol, and over this a cone of zinc phosphate is placed. Of course, the salol disappears, as it always does, after a period when used as a canal filling; but I believe that it performs office as an unirritating antiseptic while it lasts.

Dr. Guilford.—Accidents of perforation are always to be well guarded against. In those cases involving the floor of the pulp-chamber of molars, I cover them with a piece of moistened court-plaster and fill over it.

When the perforation is near the root-apex, I think it best to amputate the portion of root above the perforation. The canal is filled with gutta-percha, an opening is made through the alveolar wall above the point of perforation, and the apex of the root is cut off, and smoothed by means of fissure burs. The piece is dislodged

by means of an elevator, and the wound cavity packed with iodoform gauze.

Dr. Roberts.—I have used tin-foil instead of court-plaster for this purpose, after sterilizing the parts. Stiff zinc phosphate is then to be packed over the tin-foil.

Adjourned.

HENRY H. BURCHARD,
Editor Academy of Stomatology.

AMERICAN ACADEMY OF DENTAL SCIENCE.

THE regular monthly meeting of the American Academy of Dental Science was held at Young's Hotel, Boston, Wednesday evening, February 3, President Andrews in the chair. Subjects for discussion:

I. Retaining Appliances in Orthodontia.

II. Dental Materia Medica.

DISCUSSION.

Dr. Briggs.—Mr. President and gentlemen, that which occurs to me more and more in practice—and it is quite opposite to views that I once held—is that the dentist must more and more fit himself to practise medicine, in the line of prescribing, to a certain extent, drugs for his patients. In the old days, before the hypodermic syringe, and when certain drugs were the only ones to be found in the dentist's armamentarium,—when morphine was the only analgesic, and that was too dangerous to use unless one could watch its operations,—it did not seem proper for a dentist to prescribe the use of drugs where the circumstances would be such that the dentist could not see the actual result, and thus protect the patient from any harm which might result. Times have changed; there has been an influx of the coal-tar products, and of combinations of cocaine, which, whether they are dangerous or not, the laity have no hesitation in using, sometimes in quantities and under conditions where a dental practitioner would not.

The thing that is forcing us into it, perhaps more than anything else, is the fact that the physician refuses to be educated in dental matters. Time goes on, and no attention is paid in the medical schools to teaching anything about the mouth or the teeth, while the dentist himself is getting broader, and is reaching out

more into the domain of medicine. This tendency of the physician to ignore the dentist and his work is exemplified to us every day, and he probably knows as little to-day about the effects of these coal-tar products on the pains and inflammation with which we come in contact as the majority of the patients themselves.

Apropos of the feeling of the physician that the domain of the dentist is not in his line, I will mention a case of a physician who was called to a lady who was confined to her bed with an abscessed tooth, the abscess having formed in the roof of her mouth. The physician observed it, and said, "You must send for your dentist right away." When asked if he could not attend to it and relieve her suffering, he said no, it was something for the dentist to do. A messenger was sent to me, who explained the case, and I sent an associate, who lanced the abscess, and gave directions for the treatment until the lady could visit the dentist. The ridiculousness of a physician stating that the treatment of that abscess was different from an abscess anywhere else shows their limitations in matters connected with the mouth. Of course, we know that the principles of treating an abscessed tooth, as far as the immediate emergency treatment is concerned, are just the same as those which underlie the treatment of an abscess in any other part of the body. And so it is when a person is suffering severely from pulpitis, pericementitis, or alveolar abscess, and the physician is sent for; he is perfectly helpless, and does not know how to go to work to relieve the patient, and unless we step in and give the proper treatment the patient must suffer in consequence.

The hypodermic syringe has brought obligations upon us. If we give anæsthethics, we must be able to use the hypodermic syringe to revive patients from shock or from being overcome by chloroform or ether; then we very easily use it in many other conditions to relieve pain and assist operative interference. Our knowledge of the use of the hypodermic syringe in many of the minor surgical operations about the mouth has brought about an enlargement of our field, and has led us to do what we have hitherto not attempted, because it involved the general anæsthesia of the patient.

So, to sum up, it seems to me that instead of teaching, as I have always done, that we wanted the dentist to know materia medica in a broad and general way, as a matter of education, and to point out at times the necessities of the patient to the family physician, it has come to the point that, if the dentist is to take full charge of his department, he must be capable and fitted to apply the entire

materia medica,—not "dental materia medica;" there is no dental materia medica; materia medica is the same for the dentist as it is for the physician, and the same principles that underlie the treatment in any part of the body apply to all the conditions with which the dentist meets. I hope what I have said, Mr. President, will start a discussion.

Dr. Eames.—I have brought for your inspection a few of the advertising leaves from the January number of *Items of Interest.* On one of these "Dr. Hayes's Improved Process of Anæsthesia" is advertised, and I know that very many dentists are deceived, and influenced to pay one hundred dollars for an "office right" use of preparations, of the composition of which they are utterly ignorant, and to administer them to patients for the production of anæsthesia. It is a serious thing to administer any anæsthetic: the patient is rendered unconscious; the powers of life are, one by one, suspended, approaching the very doors of death, yet this secret mixture is held up to the profession as entirely harmless.

I think that we ought to put the stamp of condemnation on these and other secret remedies, such as "Uzane," "Paralesia," "Noxall," and others, and have it understood that this society disapproves of advertising them in professional journals. Although our society has a record of action against secret remedies, it seems necessary to act again, and I hope something will be done to-night.

I would now like to refer to an old remedy that has been revived by myself,—that is, rapid breathing as a pain obtunder. We all know that Dr. Bonwill was the first to introduce it. I happened to be present when he made a demonstration in the Pennsylvania Hospital in 1876, but I have never used it until within the last three years. One of my first operations was the removal of a sebaceous cyst. I made a free incision across it, turned out the sac, and dressed it, without the slightest pain to the patient. I have extracted teeth in sufficient numbers to perfectly demonstrate its efficacy, and have had no ill results. I do not use this method indiscriminately, but select the patient.

Now, a word in regard to the coal-tar series of remedies. We receive numerous samples and circulars regarding these preparations, but we do not always know their composition. I think it is much better, in such cases, to prepare our own remedies. For instance, ammonol is a good sedative theoretically, but practically it is unreliable. I would prefer to prescribe acetanilide with the proper amount of ammonium carbonate, freshly prepared.

We have a new product, eucaine, which is advertised as a sub-

stitute for cocaine. I believe we should test this more fully and for a longer time before accepting it as perfectly harmless. I have some reasons to doubt that it is perfectly harmless, at the same time I have used it in quite a number of instances during the past eight months. In one case I used it freely to extract five roots of teeth at one sitting, injecting it very freely, without any after-effects. I do not think that, applied to mucous membranes, it is quite as effective as cocaine.

I have been making some experiments upon animals, which I have not yet completed. As far as I have gone, however, eucaine seems to be more toxic than cocaine, killing a frog which had recovered from a similar dose of cocaine.

Dr. Banfield.—Will Dr. Eames tell us what per cent. and how much he injects of the eucaine?

Dr. Eames.—Usually a four-per-cent. solution.

Dr. Piper.—I would like to ask Dr. Eames if he has had an opportunity to notice the after-effects,—the swelling which he said occurred the next day?

Dr. Eames.—You will remember I mentioned in passing that it is claimed that there is an infiltration of tissue, and it is admitted that a swelling may occur the next day, which is painless and harmless. In my own cases I have not had marked swellings.

I do not feel that I can agree with a recent statement in one of our journals in regard to the Schleich method of infiltration, which is an excellent method of producing local anæsthesia. The statement was made that with a solution of one grain of cocaine to the ounce you might inject an ounce without any fear of the result. That would mean a grain of cocaine, and I do not think that a grain of cocaine should be injected into the system with impunity by the Schleich or any other method.

Dr. Adams.—I would like to ask Dr. Eames if he has ever tried the rapid breathing in the excavating of teeth.

Dr. Eames.—Not enough to speak definitely about it.

Dr. Wilson.—I would be pleased if Dr. Eames would speak a little more in detail in regard to the method of rapid breathing. I have heard it spoken of a great many times and never paid much attention to it, but if there is really anything in it, I should like to know just what can be done. To be entirely candid, I never supposed it amounted to anything.

Dr. Eames.—I had in mind to bring a patient here and do a little operation, but I did not think that this would perhaps come into much prominence, and hesitated about taking the time of the

Academy. I feel that in regard to sensitive dentine it might not be used so much, because it is hard work to get many patients to co-operate. You have to use a good deal of energy yourself to get the patient to make sufficient effort to bring about the result; you have to constantly urge them to breath rapidly. Its very simplicity makes the patient unwilling to attempt it. You have to be convinced of its efficacy in order to influence them. Until I was convinced, I did not urge it, but now, unless the patient very decidedly objects, I insist upon it. It lasts a very short time, and if the operation is to be extended, you have to ask the patient to continue breathing.

Dr. Payne.—Dr. Eames spoke of selecting his patients. I would like to ask him if there are any dangers connected with it that it would be well to be prepared for?

Dr. Eames.—In case of a patient with weak lungs there might be a liability to strain, which might be productive of some injury.

Dr. Stevens.—I wish to substantiate all Dr. Eames has said in regard to rapid breathing. I know that it is wholly true, and the way it came to my attention first was perhaps twenty years ago; one time when the gas was all out of the tank and a patient came in to have a tooth extracted and wanted to take gas. After the first two or three inhalations the gas gave out. I knew it would be useless to attempt to explain matters, so I allowed the patient to continue breathing air instead of gas, and it had the same effect. I was talking to Dr. Bonwill one day, and told him about this, and he corroborated my statement very heartily. He told me how he had made the discovery himself in a very similar way, and while out walking one day he began to think over the matter, and got so interested that he sat down on the curb-stone and made a study of it right there in the street. He got very enthusiastic over it, as many of you may remember. The only trouble about it is to make the patients believe it. It is such a simple thing that they will not believe when you tell them that it is only necessary for them to breathe rapidly for a few minutes and you will be able to extract their tooth for them without pain.

Dr. Clapp.—I have been very indignant for a long time at the character of the advertisements which appear in the dental journals. I am glad that Dr. Eames has brought this matter up, and, just to test your opinion with regard to it, I will introduce resolutions, which you can think over and discuss, and if you wish, I will present them in the form of a motion.

"*Resolved*, That the officers of this Academy be instructed to draw up a resolution condemning the publication in all professional journals of unprofessional advertisements.

"*Resolved*, That this resolution be forwarded to the leading dental journals as expressing the sentiment of this Academy."

Dr. Eames.—I should like very much to see a motion of this sort carried. In talking with the head of the Consolidated Company here, he asked me how I liked the journal. I replied that its articles, contributions, etc., were very satisfactory, but to have them associated with the cuts and advertisements which appear in the journal I considered incongruous and unprofessional. He replied that the journal could not live without its advertising pages; and I have thought since that if we cannot support a dental journal without its being associated with these quack advertisements, we had better do without it altogether.

Dr. Banfield.—Who is to be the judge of the advertisements, as to whether they should be allowed to appear in a dental journal? What we might consider questionable advertisements they might say were all right.

Dr. Clapp.—It certainly might be difficult to draw the line, but it seems to me that an expression of this kind would be pointed enough for the journals to understand, somewhat, our sentiments. Now, Dr. Eames has made a remark which has impressed me very much,—that is to say, he has quoted a remark made by one of the officers of the Consolidated Company, that the "journals could not live without the advertisements." It is a very great question in my mind whether it is necessary to have so many journals live; the sooner some of them die the better. We do not need many journals to take care of all the choice dental literature that is presented for publication, and I do not see why we should feel any obligation or desire to support two or three in Boston, five or six in New York, seven or eight in Philadelphia, fifteen or sixteen in Chicago and the West. For my part, I do not see why they should be supported.

Dr. Smith.—This matter can be looked at from two stand-points: we look at it from a professional point of view, while the Consolidated Company view the matter from a business stand-point. They are serving, as they think, their customers. It is strictly a business transaction, and to the person in business all advertising is legitimate which can be safely carried through the United States mails.

The remedy for this evil is in our own hands. The support of these journals rests largely with the profession, because it is through

the profession that the advertisers and publishers expect return for their outlay, and if there is anything we dislike about the journals, all we have to do is simply to refuse to take them, and refuse to publish anything in them, and the matter would soon adjust itself. If the profession would take concerted action in such matters as these, they could correct many things which they dislike. How difficult this is to accomplish, even among those we term the best and highest of the members of the profession! I have no doubt that the journal in question is a good one, but it is published in the interest of a dental manufacturing company, whose object is to bring the goods they manufacture before the dental profession. Now, we have a dental journal that is published by the profession and for the profession. I shall not attempt to say what success we are having, but I will say that so far the road to success has been uphill, and why? Because many of the men who take the INTERNATIONAL DENTAL JOURNAL, and who will tell you that they believe in its objects, when they have a paper which they consider has some merit to it, go and publish it in the *Dental Cosmos*, because they want it to reach the greatest number of readers, and an article published in the *Dental Cosmos* is read by almost the entire profession. If these men would publish their papers and ideas in a strictly professional journal, the dentists, who are ready to support anything, would soon find out that it was for their interest to take these professional journals published by professional men, and the withdrawal of this literature from the trade journals would deprive them of their value, so that the profession would cease to support them.

Dr. Clapp.—I believe that, and I believe we should do more. I believe we should let these journals know our sentiments. And for that reason I have thought the method proposed would be an effective way of bringing it to their attention. It has been suggested that the advertising in the dental journals was a business matter in the same sense as that of the various trade journals. I do not think that is so. The advertisements in the various secular papers of ordinary business do not degrade anybody, but the advertisement in professional journals of unprofessional remedies and methods does degrade the dental profession, and it is one of the most pernicious examples that is presented to our young men as they enter into the practice of dentistry. I think our disapprobation of such methods should be made known as the sentiment of the American dentist, not the Boston, or the Massachusetts, or the New England, but the American dentist.

Mr. President, I move that the resolutions which I have read be adopted by the Academy.

Dr Smith.—I heartily second the motion. Certainly there can be no harm, but great good, in expressing a sentiment of this kind.

President Andrews.—I put this motion with a great deal of pleasure. It is rumored that the privilege of the publication of the transactions of one of our largest and most active dental societies has been sold to a trade journal for several hundred dollars, —I do not remember the exact amount. It seems incredible that a society of professional men should withdraw their support from a professional journal and transfer their proceedings to a trade journal for a money consideration, and it is with much pleasure that I put this motion, to adopt the resolution which Dr. Clapp has offered.

Dr. Wilson.—I believe the motion is a good one, and while it may appear to some that the matter of advertisements is something which should not concern us, yet it is in line with keeping up the standard of the profession. What our President has said about a dental society selling their transactions was news to me.

It seems to me that if we are earnest about this motion that has been made, we might consult with other societies and see what they will do. We ought to push the thing a little further than simply acting upon it ourselves. I heartily believe in it.

President Andrews.—The matter to which I referred has made such a stir that many of its most influential members have left the society. Are you ready for this motion?

Unanimous vote.

President Andrews.—We have two subjects for discussion this evening, on the first of which, "Retaining Appliances in Orthodontia," Dr. Smith will open the debate, but before speaking on that subject he has another matter which he would like to call to the attention of the Academy.

Dr. Smith.—Mr. President and gentlemen of the Academy, preparatory to speaking on stay-plates used in orthodontia I would like to present a case showing the value of the shadowgraph in our work. The case is represented in these two models. This one, marked B, shows the condition of the mouth at the time of the eruption of the upper right lateral incisor. The left central and left lateral came through in their proper places, and when the patient was about eight years of age the case came into my hands. All I could then know was that a tooth was presenting itself, there being a fulness of gum-tissue, and I understood that the lateral

incisor had previously loosened, and that the patient's mother, or some one at home, had taken it out. The temporary central incisor was also very loose, and was extracted. The permanent lateral then erupted, and took a position inside the line pointing towards the central. Appliances were made to bring the lateral tooth outside of the lower incisors, and we waited for developments. This model shows the case in 1891, and we have watched with interest this case ever since, hoping all the time that the central incisor would soon come down. The other day the patient came in, being quite elated at seeing the point of a tooth directly over the lateral, thinking it was the central. A few days later the tooth had come through sufficiently for me to see that it was the permanent cuspid. The temporary cuspid was extracted, that being somewhat loose, and I was then very much in doubt as to what to do, having waited so long for the central to come down. I have not had time to have a cast taken showing the mouth just as it is at this moment, but this mark shows very well the cuspid tooth now picking through directly over the lateral. I got the consent of the patient to go with me to Dr. Clapp's and have a shadowgraph taken, and this work of Dr. Clapp's shows up as rather the best he has done, and we all know that he has accomplished some very good work in this line. From it you will see that there is a tooth here, the necessary right central incisor between the right lateral and the left central, that is turned half round. With this explanation, which it seems to me all that is necessary, I will pass these models about with this shadowgraph.

Now, as regards retaining appliances.

The remark that is frequently made that the correction of an irregularity is easier than the permanent maintenance of the results, I do not think is true. The disappointment which has resulted in many well-planned cases of orthodontia has been due to the too early application of retaining appliances. I think that is an error we all make. I made it myself, and by experience I have learned that after accomplishing a change in the teeth, if you allowed the appliance that did the work to remain for some time after the teeth have been brought to a satisfactory position, so that the new bone may be deposited, then the newly made appliances for retaining more readily holds the teeth in their changed position.

There is no question but what the best retaining appliance is a fixed appliance. To illustrate this, you take, for instance, a case of protrusion of the anterior teeth which have been brought into line.

If an appliance can be made by putting bands on the molars and cementing them to place, with a wire running from the molars around the front of the teeth, the ends being soldered to these bands, you have the ideal retaining fixture; but it is rarely that you can use these fixed appliances,—not because it is a mechanical impossibility by any means, but because patients object to retaining appliances that cannot be removed for certain important society events. Many of the patients for whom we are called upon to do regulating are young girls just going into society, and whenever anything of the kind has to be made, the families of the patients insist that it shall be something that can be removed when it is thought desirable to do so, and so I find that to accommodate this great demand of society I am obliged to devise some appliance which the young lady can remove just before stepping into the ball-room, and put on again immediately after returning home. Of course it takes longer for the teeth to become fixed in this way, because the tendency of the teeth to go back to their old position will assert itself upon the removal of the pressure, even if only for a few hours, until such time as the new tissue can hold them firmly in the desired position, and yet that is all we can do under the circumstances. But, as I said before, the fixed appliance is without question the ideal appliance, and the removable retaining appliances are, as a rule, better made with some form of vulcanite with metallic attachments. If a crib appliance is used, which many seem to prefer, they have to be made quite heavy, for if they are not, you will find that patients in taking them out and putting them in are apt to get them out of place, and when they do not succeed in getting them into place without much trouble, they will be laid aside.

Of course, it should be the aim in making a retaining fixture to have the smallest possible contact with the teeth in order to prevent the possibility of decay. The retaining appliance shown here by Dr. Baker a few years ago was an ideal one of its kind. It requires great skill to make such an appliance and have the bearings accurate, and in cases where teeth have only been moved out or in, an arrangement of that kind is admirable. The idea is a modification of one that is presented by Dr. Farrar in his work on Irregularities, and for the very skilful adaptation of the idea to his individual case Dr. Baker certainly deserves a great deal of credit.

In regulating cases, where we have simply moved an instanding incisor out over the lower incisors, many times the occlusion itself is sufficient to retain the tooth in position, but sometimes you will

find that after the correction of the irregularity your incisor still drops back a little to an occlusion with the lower. Now, such a case as that could be nicely retained by a simple fixture, say a band around the tooth with wire projections resting on the adjoining teeth, and yet you will find it is the desire of most patients to avoid wearing such an appliance, and your only recourse, therefore, is to again resort to an application of the vulcanite plate, with little wire projections behind the tooth keeping it from moving back.

The Watt plugs, which writers upon this subject allude to, is a method that I do not think is very much employed. I confess I never saw a case except in the pictures. When you look at the pictures and read the description of them, it would appear to be a practical thing, but to my mind it is not so feasible as it would seem. If you are intending to hold a tooth in place with a Watt plug, it is necessary that there should be a cavity. If there is not one there already, you must drill into the sound tooth and make one, and I very much doubt the expediency of mutilating a tooth for the sake of making a place to hold this plug, and I think, notwithstanding all that has been said to the contrary, that a vulcanite plate is far superior to the Watt plug method of holding teeth in place.

There is another point in regard to this matter of retaining appliances of which we often lose sight, and that is the tendency of regulated teeth to return to their old form of irregularity. There seems to be a natural tendency in that direction which in some cases it seems to be almost impossible to overcome. The teeth are moved into place; retaining appliances are put on and worn by the patient for a year or more, and then taken off, and back the teeth go to their old position, and the entire work is regarded as a failure, when really the only error was in the fact that the retaining appliance was removed too soon. In other words, there are many cases of corrected irregularities where the apparatus for retaining the teeth in their changed position should have been a retaining appliance for life,—a permanently fixed appliance, which should be allowed to remain in the patient's mouth. That is what we lose sight of. If I understand the object of our work in prosthetic dentistry, it is in part to make people better looking. If it is professional to extract natural teeth for the purpose of supplying artificial teeth and improving a person's appearance, it is certainly quite as professional to make a fixed retaining appliance by cutting into the teeth and anchoring them

by wires to hold them in the desired position, with the same end in view. There are cases where we are forced to do this. Take, for instance, a case where we have a protrusion of the incisor teeth in a patient somewhat advanced in years, say about thirty, and you have drawn them back into line and wish to retain them. The usual method of retaining in such a case is to drill into the palatal surface of the teeth and set wire retainers which rest on the adjoining teeth, so that it is impossible for those teeth to move out. Now, the tendency of those teeth to move out, especially in a person of that age, is something astonishing. I recollect a case of the kind where two central incisors had been drawn back and wire retainers, resting on the laterals, were put in, supposing the laterals would be sufficient to hold them. They not only moved forward themselves, but they took the laterals along with them. A new appliance had to be made for correcting, and the same kind of a fixture was made for retaining, except that this time it was extended to include the cuspid tooth, and there was no further trouble.

The many applications and modifications of these crib arrangements are to be governed by the individual case and the ingenuity of the operator. With so many different appliances pictured in the books, I think one shows quite as much skill in the proper selection to suit the case in hand and in carefully adapting it as he would if he set about to originate something new himself. In many instances, after spending a great deal of time and thought on some particular operation, he will find that his ingenious production is simply an old idea worked over, with some modification of his own, adapting it to the individual case.

The disadvantage, of course, of all vulcanite work for retaining is that there is so much surface in contact with the teeth that you have a great liability to decay, at least so it is claimed, and yet, out of a great many such appliances that I have put on, there have been very few, comparatively, with which I have had any trouble on account of decay; in fact, at this moment I can recall but one, and that was a case where a dentist extracted the sixth-year molars because they were badly decayed; but as the case turned out, it would have been better to have kept the molars in and crowned them. The arch had been spread to correct an irregularity, but it would not remain, and it was necessary for the child to wear a vulcanite plate constantly, and in that case the teeth decayed; but it was the only one that I remember having seen in which decay resulted from a vulcanite plate for retaining.

I think I have briefly covered the general principles of retaining appliances, but after the discussion has started, it may bring something to my mind of which I will be glad to speak later.

Dr. Ainsworth.—I wish to say "amen" to the remarks of Dr. Smith. I agree with him in regard to leaving on the appliance with which the teeth have been moved for some time after they are in a satisfactory position before undertaking to make a permanent retaining fixture, but I find a common reluctance among patients to wearing it after the teeth are in position,—that is, the appliance with which they have been moved,—and I have been many times influenced by their wishes, much to my regret.

There are four things, to my mind, that are important in a retaining apparatus: it should be positive; it should be as cleanly as possible; it should be comfortable; and it should not present an unsightly appearance.

As Dr. Smith has said, we find among the class of people for whom we are called to practice this specialty a reluctance to wearing anything that is conspicuous, and we are constantly called upon to exercise our ingenuity in making something that shall be as little noticeable as possible; but such appliances have in the main proved unsatisfactory.

A fixed appliance, it seems to me, is far preferable to a removable one, because it is much more positive, and you are sure that it is being worn twenty-four hours a day, while a removable one may be in the pocket twelve hours a day, in which case it will take a long time for the teeth to become fixed, if, indeed, they do at all. They will be very likely to go back to their former position when the appliance is finally removed.

An appliance should be made so as to have as little contact as possible with the teeth, to prevent injury and facilitate cleanliness.

I hold in my hand a case for which I had made this gold retaining-plate, designed to be unconspicuous and to please the patient. The arch had been spread and the front teeth drawn in,—a case of "thumb-sucking." This plate was put in last spring, and I discarded it in the fall as practically a failure: it was not sufficiently positive; then, too, we needed all the room between the incisors to hold them down to place, and the little gold projections on the plate coming between the incisors kept them slightly out of line. This case was one in which the patient seemed unusually disturbed lest she should have to wear something which would show too much. I finally hit upon this compound, and solved the problem in the following way, which is proving eminently satisfactory; and one of

the requisites was that she should be able at times to leave off the part which was noticeable:

I made gold bands for the two cuspid teeth, also for the two sixth-year molars; shaped a sixteen-gauge platinized gold wire to correspond with the arch and rest against the palatal surfaces of each tooth; this arch band was soldered to the bands encircling the cuspid teeth, and the ends engage in tubes soldered to the palatal surface of the bands encircling the molars; the molar bands were then cemented into position, after which the cuspid bands were cemented in place, carrying with them the arch band, the ends of which engage in the short tubes on the molar bands; this serves to hold the bicuspids and molars from dropping in, and to hold the incisors in. I soldered short pieces of gold tubes in a perpendicular position to the distal buccal surfaces of the bands encircling the cuspids, then, forming a smaller platinized gold wire to fit the labial surfaces of the front teeth, I bent the ends at right angles so as to engage in the little tubes attached to the cuspid bands; this front band can be taken off and snapped back in place at will. When off, nothing shows but the bands on the cuspids. Of course, in cases of this kind the front teeth must be held down in position a long time. In time I anticipate the patient will get along all right by wearing the band at night only.

Dr. Cutter.—I have nothing special to say upon the subject, which has already been so fully discussed.

I would, however, state that I have rarely seen any injurious effects from vulcanite and wire retaining-plates coming in contact with the teeth, yet I am always particular to instruct patients upon the importance of keeping such appliances as clean as possible.

Dr. Smith.—I will simply state that the case where Dr. Ainsworth spoke of having made a satisfactory appliance by placing anchor bands upon the cuspids, with a wire passing along the palatal surfaces of the anterior teeth, was good as far as it goes, but it only goes to the cuspid, and that is fatal. In the great majority of cases you would find that people would object to the bands on cuspids; they do not want to have any gold showing. And then, again, the objection might be offered that the wire on the inside touches the palatal surface of the teeth; if fairly large, I should fear the chances of decay in these much more than from a vulcanite plate that was removable. I have seen a number of cases where two wires were used,—one passing along the inside of the teeth, being ligated to the cuspid, and the other passing on the outside, ligating the tooth which was to be carried into line; and

I have seen more harm done in that way than could possibly have been done by a vulcanite plate pressing against the palatal surfaces of the teeth.

Dr. Ainsworth.—I would say, in answer to Dr. Smith, that the band is not a flat wire, as it appears in the cast here. It is a round wire, and does not touch the teeth except in spots that will be in the future entirely exposed to friction, where there is no ordinary tendency to decay and no fear of decay. The teeth are good and strong, and the position of the band is such that it is cleanly. If there were ligatures worn here, there might be trouble, but I have no expectation at all of this band doing any harm.

MASSACHUSETTS DENTAL SOCIETY.

A MEETING of the Massachusetts Dental Society was held on Wednesday, June 2, 1897, at the Harvard Dental College building, Boston, the President, Dr. Waldo E. Boardman, in the chair. After the routine business, Mr. James L. Gethins read a paper on "Electricity and Dentistry."

(For Mr. Gethin's paper, see page 631.)

DISCUSSION.

The President.—The subject is now open for discussion.

Dr. Willard D. Ball.—Mr. President, I would like to know what the difference would be between the storage battery and wet cell battery.

Mr. Gethins.—The storage battery is, as you may say, a reservoir of electricity. There is practically no resistance, and you can use a less number of cells in doing the work. That is the reason the storage battery is superior to the other.

Dr. S. W. Thayer.—What is estimated to be the ability of the storage battery to deliver,—that is, how much can be delivered with safety and leave some in the storage battery?

Mr. Gethins.—I should say that never more than three-fourths of discharge of the actual capacity in ampères should be taken out of the battery. If you have eighty ampères, not more than sixty should be taken out.

Dr. Thayer.—That would leave a normal quantity, enough to preserve the plates, not drawn out?

Mr. Gethins.—Yes.

The President.—The chair desires to state that he has two storage batteries of the Sorley make that have been used for the last five years, now in the sixth year. They are apparently in as good condition as ever. Adding a little sulphuric acid and water, once in a year and a half, provides for evaporation.

Mr. Gethins.—I should like to ask a question of any gentleman here who may have actually tested the question of current used in cataphoresis, if he has ever actually used a very fine recording metre? My test has been so far with voltage, and I want to see whether six is required or sixty, and I think that I have practically determined that. Speaking of that, I would like to say one thing more. It seems to me, from an electrical stand-point, that in applying cataphoresis a great deal depends upon the contact. Take, for instance, the employment of the hand for contact with the cathode, the current has got so much farther to go.

The President.—Dr. Piper has studied this subject some months, and perhaps he would like to say something upon it.

Dr. James R. Piper.—I have been using an apparatus which I constructed myself out of Mesco's dry batteries. I have in a box twelve of these, and they are turned on by means of a switch, one at a time, but the points of contact are so arranged that the switch is on two at the same time, and if you take it off of one it does not break the current. I have used it now for eight months with a great deal of satisfaction, and cannot see but that it does its work just as satisfactorily as some more expensive apparatus.

Mr. Gethins.—I would like to ask Dr. Piper how many cells he has found most effective.

Dr. Piper.—I use from three to six.

The President.—Does any other person desire to ask a question?

Dr. Fessler.—I do not know that it comes directly under the discussion, but I would ask, if cocaine is carried into the cavity, what difference how high the current or what the voltage may be?

Mr. Gethins.—From an electrical stand-point, I should say that the voltage is simply like a trip-hammer driving down on that tooth; and, as to the matter of saturation, if you cannot thoroughly insulate that tooth, it may saturate the whole jaw. I have no doubt we can saturate, to come back to the storage battery, any quantity of lead plate simply by using a quantity of current; but it does not make a particle of difference, in that particular case, whether we have ten thousand volts or two and a half volts. The only result I can see electrically would be a very *disagreeable sensation* to the patient by using *high voltage.*

Dr. Thayer.—Mr. Chairman, Mr. Gethins inquired, I think, how much current the gentlemen have been in the habit of using in cataphoresis to get anæsthesia,—is that the question?

Mr. Gethins.—Yes.

Dr. Thayer.—I have seen quite a number of instruments, and I think those most effective which one can use intelligently are those which have attached to them a galvanometer. You can measure and know what amount or quantity you can get; and the largest quantity that I have seen or found to be required to extract teeth which have calcareous matter interspersed—it is very difficult to produce anæsthesia in these cases—is five-tenths of a milliampère, and I have seen anæsthesia produced inside of five minutes.

Mr. Gethins.—I would like to ask the doctor if I am right in my supposition that the time required to accomplish this result depends a great deal upon the actual service of contact at the tooth?

Dr. Thayer.—Of course, the contact has a great deal to do with it.

The President.—Has Dr. Strout done any experimenting in the way of cataphoresis?

Dr. B. H. Strout.—My experiments have been limited, and I do not care to make any report now. I am keeping a record of what I am doing, and may make one later.

The President.—If there are no further remarks on the subject, I will ask Mr. Gethins to close the discussion.

Mr. Gethins.—I do not know that I have much more to say. There is one question which a gentleman asked me about the effect of higher voltage. The resistance of the gum that surrounds the teeth governs to some extent the actual amount of current that goes through, and I can readily appreciate the fact that there may be portions of that gum of higher resistance than others, and a higher voltage may tend to drive a larger amount of current around that place. Resistance is overcome by voltage.

In reference to a question that may be asked, how storage batteries may be charged, I have found the most satisfactory method to be by means of an improved form of gravity battery of my invention, which is simply left constantly connected to the storage cells, charging them at a low rate. This keeps the storage cells in first-class condition, and always ready for immediate use.

The life of a charging battery is six months or more without attention, and expense of maintenance about two cents a day.

Henry L. Upham, D.M.D.,
Editor Massachusetts Dental Society.

Editorial.

THE ENTRANCE EXAMINATIONS IN DENTAL COLLEGES.

The severe criticisms made upon the action of the National Association of Dental Faculties, rescinding their decision made at Saratoga, 1896, and substituting a lower standard at Old Point Comfort the present year, have apparently a substantial basis. It is, however, very clear that this action is not understood; and while it would seem to be a retrograde movement, it is not so in any sense, but rather a conservative effort to reach even a higher standard, but not by the ill-considered methods adopted in 1896.

The history of the effort to advance the standard of preliminary training, as well as the curriculum of each of the dental colleges, has never been written, and probably never will be; but there has been a continued effort in the Association of Faculties for many years to increase the requirements, but at the same time arrange these so as to avoid undue friction with the elements with which it was forced to deal.

The primary object of this body is to advance the character and the work of all the dental schools; and in order to do this each must be a mutual help to the other, bearing, to a certain extent, the burdens of the weak, and discouraging the strong in any attempts to move faster than the former could safely follow.

In the present condition of our country it is recognized that dental colleges cannot all be of equal value, and it is equally apparent that the dependence upon some few centres of education, as was formerly the case, must be abandoned. The growth and necessities of the people of each State will eventually tend to a concentration of effort for the upbuilding of that State in all directions, and thus give its own citizens the advantage of home instruction. The time was when the medical schools of Philadelphia and New York were patronized by students from all parts of the United States. To a large extent this continues, but the difference between the past and the present is marked, so much so that while the number of matriculates has steadily increased, the number from outside States and Territories has regularly diminished, leading to the remark of a distinguished teacher of surgery,

"that the medical colleges of Philadelphia were becoming local institutions," meaning by this that the students were mainly derived from Pennsylvania.

The reasons for this change must be self-evident, and it is not necessary to enlarge upon them. States as well as individuals grow out of their swaddling-clothes, and will, sooner or later, demand an independent position; and as there is no monopoly of knowledge, or the power of imparting it, new colleges have sprung up over the land, covering all departments of human intelligence.

While this is true and a cause of congratulation, it is equally true that many of these newly formed colleges are not State institutions, and are relatively weak from lack of a proper endowment. They began largely as simple dental schools, and although chartered as colleges, with all the legal rights attached thereto, they are financially weak, and it becomes with them a struggle for existence.

It may be said by the critical that this means that they ought to die. This is not the view of the writer. There is not a dental school in existence to-day that has not gone through all the phases connected with a struggle upward, not excepting even those connected with universities; and, besides, outside of our large cities, these new colleges are needed, especially in the South and the far West, and every encouragement should be given these until they have finally laid their foundations strong enough to resist all destructive elements. It may be said, and with truth, that there is a limit to this multiplication of colleges, and that the Association of Faculties cannot forever be dragging the older institutions in the mire, in order to save these weaklings. It is true that there is a limit beyond which it will not be safe to go, and that limit is very nearly reached. When this time comes there will be no new colleges admitted as members, except they demand a standard equal to the best. In the mean time the dental colleges connected with universities, and those not so connected, but firmly established, can formulate their own standards, and thus set an example by demonstrating that a dental college can make its own terms and gain in respect and patronage by so doing. This has become a recognized fact in dental and medical departments and in higher colleges, so much so that it has become almost axiomatic that the higher the standard the larger the number of students.

When the National Association of Dental Faculties adjourned last year, 1896, it was with the comfortable feeling that the entrance examination had been raised to that of the freshman year

in a high school. The final preparation of this was given to a committee to formulate and print in the Proceedings. This committee contained one gentleman of large experience in educational matters, but who was not a member of the Association of Dental Faculties. This training fitted him for general educational work, but naturally he could not comprehend the needs of a profession, and especially so recent a development as dentistry. The result of the work of the committee was a series of rules in which applicants for matriculation were required to reach a certain standard, and this was minutely detailed. When this report was published it was at once recognized that this was not what the National Association of Faculties had ordered; in fact, it was in excess of anything anticipated when authority was given the committee. The publication created general disturbance in college circles, for it was felt that the rules could not be carried out in the present existing conditions of dental education.

When the "Faculties" met at Old Point Comfort, the first thing that confronted the delegates was a determined opposition to these formulated rules, and this became so pronounced that nothing was left for the Association to do but to endeavor to retain the position of previous years of a standard equivalent to that required for entrance to a high school. It is very questionable whether this can be raised in the near future, but there is nothing to prevent individual dental colleges from advancing the entrance examinations to suit themselves.

The charge that the National Association of Dental Faculties took a backward step in 1897 is not true. It simply adopted, in plain terms, what it presumed had been adopted the previous year. The lesson learned was that it is never safe to leave any subject in the hands of a committee that requires the critical care of the entire body. Upon this rock many associations have gone to pieces, and that the Association of Faculties was safely landed in deep water without special injury is a cause of congratulation.

This conclusion has, however, no permanent features. The Association cannot afford to occupy this low position for any great length of time, and it becomes the duty of all dental colleges intrinsically weak to remember that this adjustment is only temporary, and that the stronger colleges cannot and will not much longer bear the burdens of the weak, but will insist that those who have sought fraternal association must continually struggle to meet the higher standard demanded by the increased intelligence and broader education in the scholarly circles of the world.

Domestic Correspondence.

REPLY OF DR. FAUGHT.

PHILADELPHIA, PA., September 10, 1897.

TO THE EDITOR:

DEAR SIR,—As my honor has been assailed by the letter published on page 540 of the August number of your journal, its protection now requires that I should state to the profession that every word and statement contained in my letter published in the July issue, page 482, is according to the stenographer's notes of the meeting in question, a copy of which I have in my possession, certified to by the signature of the official stenographer. I wish also to say that all the inferences to be drawn from any other publication that I at any time attempted to falsify the records of the Society are not founded on facts.

Sincerely yours,

L. ASHLEY FAUGHT.

[It has been with some regret that we have felt obliged to admit this personal controversy to our pages, and now, having given both sides ample hearing, the matter must close so far as this journal is concerned.—ED.]

Current News.

NATIONAL ASSOCIATION OF DENTAL EXAMINERS.

AT the annual session of the National Association of Dental Examiners, held at Old Point Comfort, Va., July 30 to August 2, 1897, twenty-two States present, the following officers were elected for the new year:

President, C. G. Edwards, D.D.S., Louisville, Ky.; Vice-President, G. L. Parmele, D.M.D., Hartford, Conn.; Secretary and Treasurer, Charles A. Meeker, D.D.S., Newark, N. J.

The president appointed as members of the Committee on Colleges, G. Carleton Brown, D.D.S., chairman, Elizabeth, N. J.; J. A. Hall, Collinsville, Ala.; M. H. Chippell, D.D.S., Knightstown, Ind.; L. Ashley Faught, D.D.S., secretary by appointment of the committee, 1415 Walnut Street, Philadelphia, Pa.

MASSACHUSETTS BOARD OF REGISTRATION IN DENTISTRY.

A MEETING of the Massachusetts Board of Registration in Dentistry will be held in Boston, Monday, November 15, 1897. Application should be made at once to

E. V. McLEOD, D.D.S.,
Secretary.

NEW BEDFORD, MASS.

PENNSYLVANIA EXAMINING BOARD.

GOVERNOR HASTINGS has appointed the following State Dental Examining Board under the new law:

Harry Gerhart, Lewisburg, and Jesse C. Green, West Chester, to serve one year; C. W. Klump, Williamsport, and J. A. Libby, Pittsburg, to serve two years; C. V. Kratzer, Reading, and H. E. Roberts, Philadelphia, to serve three years.

Selections.

ACETANILIDE AS A DRESSING.

MORTON writes in the *Polyclinic* of February 16, 1895, that the action of acetanilide upon wounds, especially granulations, when used in full strength, is to produce intense dryness, blueness, and to check at once and to prevent the formation of pus. Upon extensive granulating surfaces and chronic ulcers a slight burning sensation is at first perceived, which is rapidly succeeded by a sedative or anæsthetic effect. If used in sufficient quantity, a thin scab of acetanilide, combined with the wound secretions, forms, under which healing rapidly progresses. If a very large surface is exposed to the action of the undiluted drug, toxic symptoms promptly supervene in susceptible individuals. It is probable that children and the aged are more sensitive to its absorption than are vigorous middle-aged persons. It is also probable that anæmia might follow too prolonged application of large quantities of the substance, because of its destructive action upon the red blood-corpuscles; this, however, he has not seen. The powder does not, as a rule,

stick to wounds or hold dressings fast; but when it does so, alcohol causes instant release by dissolving the drug.

Under no circumstances does acetanilide irritate the skin or wounds, even when used beneath impervious protectives or antiseptic poultices.

What may be the best vehicles for applying acetanilide must yet be proved. Upon most of his cases the pure powder was used from a dusting-box. This, while usually safe, he thinks has been an unnecessary waste, for very recent experiments in dilution have shown him that a one-fifth- to one-per-cent. mixture with petrolatum was sufficient to arrest suppuration and secure rapid healing in an extensive septic scald. All pain vanished after the first application.

Acetanilide dissolves in five volumes of alcohol, in twenty volumes of ether, and in two hundred volumes of water. It is soluble in liquid petrolatum to the extent of forty grains to the ounce. In chloroform it very freely dissolves.

By diluting with water a saturated alcoholic solution of acetanilide, the drug will be thrown out of solution in the shape of fine crystals, and will remain perfectly mixed in suspension long enough to permit of its use in this form as an injection for abscesses or carbuncles, in gonorrhœa, etc.

In the large number of cases in which he has freely employed acetanilide, but twice have toxic effects been noticed; one was in an infant aged fourteen months.—*The Therapeutic Gazette.*

COCAINE.

At the meeting of the Académie de Médecine, M. Reclus made some remarks anent cocaine. He said that local anæsthesia by injections of cocaine, of which he has been a strong partisan for the last ten years, has not yet found many adherents. He thought it necessary, consequently, to recall in a few words the principles to be observed in its employment, and to explain at the same time the reason why accidents have been reported from time to time from its use. At first he would affirm once more the eminent anæsthetic properties of cocaine, which he considered to be superior to all those used with the same therapeutic object, and in particular to guaiacol, that had recently been warmly recommended by one of his colleagues.

He (the speaker) had made a comparative study of both of these agents, employing them in the region he was about to operate, one on either side; he found that anæsthesia was complete in the part which had received the injection of cocaine, while the sensibility was not entirely abolished in the region submitted to the guaiacol. The accidents attributed to cocaine were due to the operator, and not to the drug, and could have been easily avoided if the indications he had repeatedly laid down had been followed, and which consisted in employing only one-per-cent. solutions, and never to exceed the total dose of three or four grains of cocaine, to always place the patient in a recumbent position, and to avoid penetrating a vein.

It was by observing these rules that he was able to practise three thousand five hundred operations without one accident; not even did he once observe an attack of syncope or vomiting.

He employed cocaine exclusively in cases where the field of operation was not too extensive. That is to say, he did not use it in abdominal surgery nor in amputations of the limbs. However, in two cases, where he was not able to give chloroform by reason of cardiac trouble, he used with success cocaine in amputating the arm.—*Paris Cor. Med. Press and Circular.*

UROTROPINE.

The favorable reports that have come to my notice regarding urotropin lead me to think that some additional facts concerning it may not be amiss. Urotropine is a derivative of formic aldehyde, and not a coal-tar product. The well-known antiseptic and preservative power of formic aldehyde in solution led Nicolaier, of Göttingen, to use the solution of formic aldehyde, containing forty per cent. of the gas, and known as formalin, as a means of preserving specimens of urine from decomposition pending examination. He noticed that neither uric acid nor the amorphous urates were deposited, though the same specimens not treated with formalin deposited either or both, as the case might be. Even when already precipitated, these substances underwent solution when formic aldehyde was added to the specimen. Urines that readily deposited large amounts of uric acid when acidulated with a mineral acid did not do so when a sufficient amount of the preservative was added.

The results of these investigations prove very conclusively the great uric acid solvent power of formalin. The reputation of the lithium salts as uric acid solvents is caused by the common error of applying the results of laboratory experiments to practical therapeutics. The fact that lithium forms an insoluble phosphate, and that the blood and urine contain considerable amounts of soluble phosphates, show that lithium salts, given by the mouth, must form insoluble phosphates of lithium long before they can combine with the uric acid. In this respect it is no exception to the chemical law that when the ingredients for the formation of an insoluble body are present in a mixture this body will always be formed. Medical opinion has for a long time attributed the success attending the use of the lithiated waters to the water and not to the lithium that they contain. A similar error obtains in the case of some more recently introduced substances, lycetol, lysidin, etc. They do not, in the urine, form the very soluble uric acid combinations that they do outside the body. Formic aldehyde being too irritating to be taken internally, Nicolaier then determined to try its amine combination as a substitute. This substance, hexamethylene-tetramine or urotropine, is non-poisonous even in considerable quantities, is unirritating, very soluble in water, and is as good a uric acid solvent as formic aldehyde itself.

The name urotropine was given to it on account of the changes which its administration brought about in the urine. Alkaline and putrid urines, containing mucus in excess, pus and pus organisms, uric acid or amorphous urates, were rapidly restored to a normal appearance and an acid reaction. The urine was sterilized and increased in quantity, and calculi and deposits were dissolved. Hence urotropine is a most valuable resource in all suppurations of the urinary tract, and in all gouty and rheumatic conditions where an active eliminant of uric acid and its salts is indicated. A further valuable property of urotropine is its faculty of combining readily with salicylic acid and forming a soluble combination. A solution containing from ten to fifteen grains each of urotropine and salicylic acid to the fluidounce of water or other suitable vehicle has the further advantage over the salicylates alone in that its taste is not disagreeable. It appears to be far less irritant to the gastric mucous membrane than solutions of salicylic acid usually are, and the combination promises to have a wide range of therapeutic usefulness.—J. A. Flexner, M.D., *American Practitioner and News.*

THE

International Dental Journal.

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Original Communications.[1]

DIPHTHERIA.[2]

BY GARDNER T. SWARTS, M.D.[3]

I feel, of course, highly honored to speak to you on any subject whatever, but feel especially pleased to think that gentlemen in your line of work should devote some time to learning something about a disease in which I have been especially interested. Of course, men in the medical profession should be specially interested in all diseases, but the question of typhoid fever and this subject of diphtheria are topics that are of especial importance to us, because of the great number of human lives involved.

I am sorry on account of the regularity in the publication of your transactions that I have no paper. My apology for not presenting one is that the subject, being rather dry, the reading of a prepared paper might be recommended as a cure for insomnia, and that is not the effect which I wish to obtain this evening.

The word "diphtheria" comes from the Greek, and means "a tanned hide." The reason for that, I presume, is the resemblance of the characteristic form and texture of the membrane which is

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[1] The editor and publishers are not responsible for the views of authors o papers published in this department, nor for any claim to novelty, or otherwise, that may be made by them. No papers will be received for this department that have appeared in any other journal published in the country.

[2] Read before the American Academy of Dental Science, March 3, 1897.

[3] Secretary of the Rhode Island State Board of Health.

found in this disease, which we have called diphtheria. As we come later to the clinical symptoms, we will find that this analogy is very close.

Diphtheria, as the disease diphtheria, may have been with us for centuries, but that claim is disputed by many able men, especially the older practitioners, who practised back in the fifties, who give us the historical information that this disease, with this peculiar formation of membrane, did not make its appearance in the United States until about the year 1857 ; that previous to that time we had sore throats, tonsillitis, pharyngitis, laryngitis, quinsy,—we had various formations in the throat and inflammatory conditions there, but nothing like that which we now characterize as diphtheria and with which peculiar constitutional symptoms occur. This disease in the production of its symptoms is very characteristic, and when a typical case occurs is not mistaken for any of the other conditions ; but, unfortunately for the patient as well as for the physician, those constitutional symptoms, by which we can determine whether the disease is or is not diphtheria, very often do not present themselves until possibly we are about ready to sign the death certificate. In fact, it has, up to within two or three years, been a common saying among physicians that if a person presented himself to a physician with a tonsillitis or an ordinary sore throat and he wanted to make sure of his diagnosis, the better way would be to have his treatment follow pretty closely the treatment he would prescribe for diphtheria, so you can understand how he has been at sea with regard to this disease. When he thought he was treating possibly a case of tonsillitis, the patient would die, and that would be the first intimation that the physician received that the patient was suffering from diphtheria. Of course, that was very unfortunate for the case and for the physician as well.

When a case of diphtheria appears it commonly presents itself as a simple sore throat. Usually for true diphtheria, uncomplicated with any local inflammatory condition, the symptoms are not very well marked. Even children, who are apt to have it pretty severely, will make little or no complaint in its earlier stages, and adults will treat the case as just a simple sore throat, whereas in many of the less dangerous diseases of the throat, especially follicular tonsillitis, the pain and distress occasioned by swallowing are so great that the patient's alarm is proportionately great, and this peculiar condition has to be borne in mind in looking for the symptoms. Of course, the temperature and pulse are also to be considered, but here again we find another difficulty. In true diphtheria we find a

rise of temperature of not over 101° or 102° F., whereas in a simple follicular tonsillitis, occurring in some people every fall, the temperature will run up to 103° or 104°, or even 105°, giving alarm to the patient and the physician. This is one of the points of distinguishing between the malignant disease and the diseases which are not dangerous. If, in looking in upon the throat, the fauces are found to be more or less reddened, the tonsils possibly bulging out and excreting a certain amount of fungus, and there is generally a great deal of inflammation and corresponding distress to the patient, we may feel, from the clinical examination, that we are dealing with a case of simple pharyngitis; but, however trifling the inflammation may appear, if we discover in connection with it a slimy white patch, with a firm consistency, whether it be the size of a pinhead or whether it cover the whole of the pharynx, and whether the patient is much or little distressed, clinically, we are justified in the belief that it is diphtheria. We find a white patch in other oral and throat-diseases, but in those cases the membrane is soft and easily pushed aside. If it is true diphtheria, this false membrane, when removed from the throat forcibly, is found to be a tough, a tenacious, thick, clinging membrane, which has been described as a "leathery patch," which is removed with some difficulty, and leaves a denuded, bleeding membrane behind. This is not the case with the soft membranes which are found in the other diseases which are allied to this.

The symptoms which we look for, then, are more or less inflammation in the throat, more or less rise of temperature, more or less depression of the heart, and the presence of the tough, white membrane. There we have, first and last, the clinical symptoms that are present in cases of diphtheria; but, as I have stated, many of these symptoms being present in other diseases, we have chiefly depended in our diagnosis upon finding the actual typical membrane of diphtheria. We have learned a great deal in the last two or three years, and this knowledge has been brought about by the study of bacteriology, and particularly since Klebs and Löffler, a Frenchman and a German, in their combined investigations, discovered a micro-organism, a bacterium, which was always found when this tough, thick membrane was present, and even when it was not present, when the symptoms were as severe as I have described with regard to the extreme depression of the system. This organism was called the Klebs-Löffler bacillus, and at the present time it is the seeking out and finding of that organism on which we depend for our diagnosis instead of depending upon finding the typical membrane. We

have found that it makes up the greater amount of this white membrane, and these bacilli, finding suitable food in the mucous membrane of the throat, become firmly lodged there, thus causing the bleeding which happens when the membrane has been removed. In studying out the manner of growth of these organisms, it is found that oftentimes the patient will exhibit all the constitutional symptoms of the disease and yet the membrane may not form, so we are unable at the present time by examining the throat to determine if the bacillus is present or is absent. If the white membrane is present, we look out for mischief; if it is absent, it is not positive proof that the organism is not there. Neither does the amount of inflammation present assist us, except that we may conclude that those cases which seem to be most alarming clinically are probably not diphtheria. It is not enough that the organism finds its way into the throat to produce diphtheria, it must also find in the throat an inflamed condition which will cause the exudation of serum and be a suitable nutrient media, an agreeable soil on which it can grow. If it falls upon a healthy throat, it is like grains—oats, wheat, or other grains—which fall upon rocks, they will not grow, even under the most favorable climatic conditions, whereas if they fell upon suitable soil each grain would duplicate itself many hundred times. So it is with these organisms. While they may be present in the mouth, they will not multiply unless the conditions are favorable, and it is because of this that many persons who are not suffering from diphtheria themselves go about disseminating these organisms in the various methods, of which I will speak later, causing the mischief which we call epidemic.

Now, the ways in which this disease can be transmitted are very numerous. Probably the most common way is by means of a common drinking-cup, or using cups and glasses that others have used. In talking to you, I am proceeding on the assumption that you all believe that the organism may produce the disease, and therefore shall not go into the details of the bacteriological investigations any further than to say that the fact that some diseases may be transmitted from one person to another is proved by showing that the bacillus can be taken from the body, can be grown in a suitable media, and can be reproduced in animals or other persons, with all the constitutional symptoms of the original disease. This, of course, it is possible to do with diphtheria. As I say, this organism in a healthy throat does not produce the disease always, but is very liable to in a throat where there is any inflammation, and it can easily be seen that the drinking-cup is one of the most

direct means of transmission from one individual to another; and this has led, as you have probably learned, in several churches to the adoption in the communion service of individual drinking-cups instead of the common drinking-cup. There is a great deal of opposition to this, many claiming that it is not a communion unless from the same cup; but the claim goes back that the pitcher from which it is poured is the common cup, consequently the distinction cannot hold. The method, which was first adopted in Brooklyn, I believe, and is now used in some of the New York churches, as well as other churches through the country, is to place these individual cups on trays holding say twenty or thirty, and these are passed about among the congregation with great celerity, and the whole practice is carried on more quickly than by using the common cup. As an illustration of the effect of the use of the common cup method, a case is cited of a lady in Providence who was prevented from participation in the communion service each Sunday, to her very great regret, by the fact that there sat in a pew just in front of her an old gentleman who had a carcinoma of the lip, and she could not bring herself to drink from the cup which was offered to her directly after he had used it; so really the use of the individual cup would bring her perhaps in closer communion with the congregation than the other method. Other means of communication are familiar to the health departments of the various cities, especially among children. One reason, perhaps, why the disease is more common among children is that their playthings are often used in common. You can readily conceive how the use of a fish-horn passed from mouth to mouth may be a means of transmission of various diseases. And then in the public schools, the books and slates and pencils are used in common, and mouthing the pencils is a direct means of transmission. I can give you a good illustration of one of the simple ways by which the disease may be effectually transmitted. I was called to a case of diphtheria, and found a child moribund, or who would be within twelve hours, and the only case of diphtheria in the neighborhood was a child in the same house, who had had proper treatment and had recovered from the disease, so that the case was one which, before the advent of bacteriology, would have been very difficult to explain. The dying one had been away from the house until the child who had been sick was pronounced entirely free from diphtheria and the house had been fumigated, and it was thought there could be no more danger from the disease. Perhaps, if circumstances had not come about as they did, there would have been no danger; but it so happened that the child who had been

sick had a ring on its finger which it could not get off. Now, you know, the way to remove a ring that fits tightly on the finger is to suck the finger and moisten it, so in this case number one sucked the finger and did not succeed in getting it off, and then number two tried it, and you can see that the child who was apparently fully recovered from diphtheria was making a direct inoculation from its own throat into the throat of its playmate, and the result was fatal. Other means of transmission among children are the swapping of stick candies and the generous division of chewing-gum with their playfellows; in fact, the conditions are favorable with children for the transmission of the disease. With older persons there are not so many chances of contracting it, and in a great many cases it is difficult to trace it, the patient not having been anywhere where there was diphtheria, and it can only be accounted for by the theory that the bacilli must have been present on some food utensil, and getting into the throat, a proper soil for its growth was found, and the organism reduplicated to the extent of producing the disease.

This organism is a rod-shaped affair, one millimetre in size, and will grow on almost any media composed of animal material, but it does not grow readily upon dirt or other material outside of the body. It grows readily in bouillon, such as is served for soups, with peptones and salt added, and if we add sugar to that it grows more readily; but if we mix one part of bouillon and three parts of blood-serum we have delightful culture media, upon which this organism will grow with great celerity, particularly so if it is kept at the ordinary temperature of the human body, which is about 35° to 37° C.

In order to put the knowledge that we have to practical use, the health departments of various cities—New York being the first to adopt the method, Washington, Denver, Providence, and many other cities following—have taken up this method of diagnosing the presence of diphtheria by means of finding this particular organism in the throat. Of course, to do this with the patients all over the city, with the large number of physicians attending them, would seem to be impracticable; it would seem as if the technical knowledge required of the physicians for the manufacture and growth of this organism would not permit of its being carried into practical use, but the system has been so nicely developed that any physician who can succeed in seeing the back of a throat will be able to do as well as some other physicians in this matter of diagnosis. In order that physicians may have facilities for growing

the bacteria of diphtheria, the boards of health in many cities have caused to be placed in drug-stores or other places in convenient localities this simple arrangement, which I will show you, where the physician may call and get it and use it according to the instructions whenever he wishes to make certain of his diagnosis in the case of a sore throat. It consists of an ordinary slate-pencil box, such as the children have, simple in construction, which is wrapped in waxed paper for two purposes, one being to prevent the evaporation of the moisture which is with the serum, and the second is to prevent, if possible, the contamination which is contained in the box being disseminated to the messenger or to any one else touching the box. The box contains one tube of this prepared serum, which is composed of two-thirds serum and one-third bouillon. After this has been prepared it is placed in a steam sterilizer. That kills all organisms that we do not desire to grow, because when we come to make an examination of our culture we want to be sure that everything there came from the throat. The other organisms which are liable to be there if this precaution is not taken are the ordinary bacteria of decomposition which will be found in the slaughter-houses and wherever animal tissue is decaying. In order to get the growth on this serum, the circular of instruction directs that we shall take the swab, consisting of a piece of ordinary iron wire, around which is placed some absorbent cotton, and that swab is used for the purpose of swabbing the back of the throat, giving it a circular twist over the whole of the fauces and wherever there is any of this slimy material. A portion of that is caught on the swab, and the swab is then run lightly over the surface of serum. The swab and serum are then replaced in the box, which is carefully wrapped up and sent to the office of the board of health, together with the name of the patient from whom it was taken and the physician who made the examination. Proper record is there made, and the box is again sent to the bacteriologist, who is to grow the culture and make the examination and decide whether the germ of diphtheria is there or not.

To go back to the serum which the physician has sent in: it is placed in the incubator, which is kept at a temperature of 37° C. day and night, constantly, and under these conditions of a suitable media at the right temperature the organisms thrive and grow, and the result is that on the following morning there will be upon the surface of the serum some sort of a growth, some organisms, if the procedures have been carried out as directed, and that growth under a small, low-power lens will manifest itself in the form of

little round dots. These dots are what we call colonies,—that is, wherever an organism has been placed on the serum it has gone to work and reduplicated itself and introduced a new colony. As it is estimated that the growth from one organism will amount to about a million in twenty-four hours, you would readily suppose that the colonies would be very large, and if they should continue to grow at that rate we would soon be forced off the face of the earth; but Nature has provided that there shall be a limit to this reduplication. Of course, if we congregate in rooms that are too small, we soon die from the effects of it, and so it is with these organisms,—when they grow faster than Nature desires, they kill each other out and the growth is checked.

The question now before us, when we find these little colonies on the serum, is, What have we here? Is it a benign bacillus or a malignant one,—a disease organism or an ordinary one? Taking a loop of platinum wire, a small portion of the surface of the serum with these colonies on it is scooped out and rubbed over the surface of an ordinary microscopical cover-glass; it is allowed to dry, and is then stained with a solution of alkaline methyl blue, and the sample is examined microscopically. Then comes the question, which is so important for the patient, for the physician, and for the health department to solve, Are those bacilli of the species known as the Klebs-Löffler? If they are, then the sample is marked "K.-L.," and the result is reported at once by telephone to the physician who sends in the culture, in order that he may avail himself of that knowledge in treating his patient, and for the purpose of using antitoxin if he so desires.

If we do not find the Klebs-Löffler bacillus, it is regarded as a favorable sign for the patient, but not a decisive one. There are several reasons why the diphtheritic germ may not show in the culture, even though it was really present in the throat. The physician in the case may not have reached the back of the throat; he may have contaminated the swab with some other organisms, whose growth may have prevented the growth of the Klebs-Löffler bacilli; he may have failed to rub the swab properly on the serum; so that while we consider that the finding of the Klebs-Löffler bacillus is positive evidence that the patient has diphtheria, yet we do not consider that the absence of that organism is positive evidence that the patient has not diphtheria, and many times a second trial will give us a pure culture of the organism that we are looking for.

Having determined that we have a case of diphtheria, our next

step is to at once, without going into the detail any further, notify the local board of health, which immediately, through its inspector, proceeds to placard the house,—that is, to put a card on the door stating that there is diphtheria in the house,—and also to distribute circulars of instruction to the family of the patient and any others who may be in the house. There was formerly great objections to this,—it was supposed to be a stigma on the family; it warned people not to go near them, for they were dangerous; they felt that they had lost their social standing and that they were looked down upon by their neighbors. This objection we have succeeded in partly overcoming by diplomatic means,—by telling them that in permitting this card to be placed there they are protecting not only the public, but are protecting themselves from trouble. For instance, if the card is on the house, any one coming in there does so on their own responsibility, and they have no redress if they contract the disease; if the card is not on the house, a person who may have had occasion to visit the house and afterwards contracted the disease at some bargain-counter or in the street-car or in a restaurant may bring suit against the parties who had refused to keep the card in sight when it was known that there was a case of diphtheria in the house. The result of this argument is that the majority of people now prefer the protection instead of objecting to what they used to consider a restriction. I regret to say that it is not only the lay people who give us trouble in this respect, but there are many physicians who have not yet seen fit to accept these facts regarding the infection and progress of the disease. They insist that there is no diphtheria there if they do not find the false membrane. The effect of their taking this position has given a great deal of trouble; in the city of Providence four lawsuits have been brought against the authorities as a result of having placed placards on houses where the physician in attendance had declared that there was no diphtheria, he depending entirely on finding the white membrane. The health department depends entirely upon the culture, and if that shows that there are organisms there in the throat, even though the membrane may have disappeared, the card remains, and as a result there is contention by law,—in other words, it is science against ignorance,—which will have to be fought out before intelligent courts. We have in the hospital now a case which is an excellent example of this absence of the clinical evidence of the disease. The membrane has long since disappeared, but we have taken ten or twelve cultures from that throat, extending over a period of eight or nine weeks, and we have found the

germ in every one, while others in the same ward have come and gone within the same period. There is a case on record in the Boston Hospital of a lady from whom it was very difficult to expel these organisms; she continued to have them from early in May until late in October. You can readily see what a source of danger such a person would be to the public if she went about as if in perfect health. There is very little fear of infection if the patient is at the hospital or is properly quarantined at home, except to the nurse. It is the time when they get well,—that is, when they feel well and no longer suffer from the constitutional effects of the disease, and they go about among people,—that is the time when they are more dangerous to the general public than when they are critically ill themselves.

Now, the peculiar feature of this disease, as well as of other diseases caused by various kinds of bacteria, is the fact that it is not the bacillus itself which does all this harm, but in the process of its growth it produces a poison, a toxin, and this toxin, being absorbed by the system, produces constitutional effects to the extent of causing death; or, on the other hand, to the extent of the system finally becoming able to resist the action of the toxin. Immediately upon this toxin taking effect upon a patient, an antitoxin begins to form, which is quite antagonistic to the growth of the organism and to the formation of the toxin; the constitution being strong and capable of resisting the action of the toxin until a sufficient amount of this antitoxin has been formed, the throat of the patient, which before was a very desirable soil for habitation and reproduction of the bacilli, now becomes distasteful to them, and the reproduction ceases. On the other hand, if the system is not able to resist the effects of this toxin, the reproduction goes on, and results in the death of the patient. Now, making use of that knowledge that we have of the growth and effects of this bacterium, we set about to see if we cannot find some means of counteracting it, something which we can use for the treatment of this disease. That is done by a series of experiments progressing from laboratory to animals and from animals to man. We take the organisms which we know to be pure diphtheria and put them into a bouillon media, and allow them to remain in an incubator for forty-eight hours, during which time a rapid reproduction goes on, and taking a certain portion of this culture, we inject it into a horse. We could obtain the same results from other animals, but the horse is used because it is larger, stronger, gives more serum, and is less prone to die during the operation. Within twenty-four hours after the culture is injected

he has a slight chill and a slight fever. When he recovers from this, we introduce double the quantity of toxin, and go on repeating this until we can introduce quite a large amount of the toxin without producing this fever, and this is a matter not of one or two days, but of six, seven, or eight months. The horse at that time has produced within the blood a quality which neutralizes the effect of that particular toxin whenever introduced. We then consider him as immunized, and his blood has within it the antitoxin quality which is so antagonistic to the development of this bacterium; in other words, they refuse to grow on suitable soil if there is this quality in the blood. Our next step, then, is to extract the blood from the horse which has been thus immunized, under antiseptic precautions, of course, by tapping the jugular vein and drawing off one or two gallons at a time. This is allowed to stand in the ice-chest until the clot is formed, and the serum is then combined with a suitable preservative camphor, and carbolic acid seems to serve the purpose very nicely. Now, taking this material, it is used on smaller animals for the purpose of ascertaining its strength. Various animals may be used, but the guinea-pig seems to be the most serviceable for bacteriological work. If we inject the toxic material into the guinea-pig, he dies in twenty-four hours. If, however, after the toxin has taken effect, we inject the antitoxin, we find that the guinea-pig recovers. The question now is, Where do we get the balance? How do we know how much antitoxin is going to be required to neutralize a certain amount of toxin? What is the unit from which we can proceed? Of course, it has taken a great deal of investigation to learn that one-tenth of a cubic centimetre of antitoxin would neutralize the effect of a cubic centimetre of the toxin,—that is, the antitoxin serum neutralizes ten times its strength in toxin. But the antitoxin seems to have the effect of stimulating the system in such a manner as to check the growth of the organisms. It gives assistance to the leucocytes, which are the large, round, white cells which are in the blood, and which seem to have a police protection over the body. These leucocytes have the power of resisting whatever poisons may have entered or generated, whether chemical or bacterial; they endeavor to overcome the effects of these poisons and to expel them from the system. So long as the leucocytes have the power to resist or dispose of the harmful organisms, so long are we able to resist disease; but if the whole system is depressed, then the leucocytes do not respond so quickly and vigorously, and these organisms of various kinds gain a firm foothold, and the toxin which is given off during the pro-

cess of their growth is absorbed into the system. If we succeed in getting in the antitoxin soon enough, before the nervous system has been saturated with the toxin, we assist these leucocytes in their battle with the organisms, and the patient becomes an uncongenial place for their growth.

We may be asked, How do you know that this antitoxin is good for the patient? We reply, Statistics have shown this to be the fact. But statistics may be used in various ways. The figures of reliable observers show that the mortality, which was perhaps thirty to thirty-five per cent. of the total number of cases before the use of antitoxin, has decreased, until it is now claimed that but about seven per cent. of deaths occur where antitoxin is used. The argument is also raised by the other side that it is not a virulent epidemic; that under certain climatic conditions the organism has a more severe action. Personally, I do not rely so much upon statistics as I do upon actual observation, for when you are called to your patient, you find the trachea obstinately producing a whistling sound, gasping for breath, the throat tumefied to the extent that it almost prohibits the passage of air to the lungs, and covered with excretions, with that dreaded membrane, and in one night after the injection of the antitoxin the changes occur, and on your next visit the patient may be respiring freely, the slimy material has disappeared, and the tumefaction has subsided, leaving usually that white, tenacious, leathery, tough membrane standing out in its true character. This we consider the most effective argument for our present system of diagnosis and treatment of diphtheria, and where it is of especial value to us is in determining the character of those cases where there are no symptoms present, the liability being so great in such cases of transmitting the disease to others. The importance of this was never understood until recently. After a case of diphtheria had recovered, we went through the usual process of fumigating, and thought we had completely eradicated the disease from that house; but in a couple of weeks we had another case in the same house, and we could not understand how it happened. We have now followed the matter up, so that the law of the city of Providence requires that when a child has had diphtheria and desires to return to school, it shall be shown that there are no diphtheria bacilli in the child's throat, nor in the throat of any member of the family. It has entailed lots of work, but it has taught us a great deal. We have a pretty good control of the disease when patients are admitted to the hospital. They are not allowed to go from there until we have obtained negative cultures

on three consecutive examinations. That places us in a very certain position with regard to the patients' condition when they leave the hospital, and our experience in this matter has shown the value of this precaution, for of the number of cases examined as precautionary about twelve per cent. showed the presence of the diphtheria bacillus for several days after the patients appeared to be fully recovered. Now, if that twelve per cent. had been allowed to go free, it is impossible to estimate the number of cases which might have resulted, though the original patients would probably not have succumbed to the disease.

In the use of the antitoxin the method which is employed is to use a quantity which we think is equal in proportion to the weight of the person requiring it, and that amount runs all the way from one thousand to two thousand antitoxin units. The usual method of introduction is by means of an ordinary syringe, such as is used for drawing off pus from a cavity, and the cylinder used to be capable of containing about five cubic centimetres; but now they have succeeded in immunizing horses to such an extent that two cubic centimetres of serum will do what ten used to do. The place selected is usually a place where a fold of the skin can be caught up between the thumb and forefinger,—by some, between the scapulæ on the back; by some, on the thigh. The place which I select is the side of the abdomen just below the ribs. The skin here is less tense and can be easily grasped, and if there is a movement of the patient, less motion is found than nearer the extremities. Though the pain to the patient is nothing more than would result from a pin-prick, there is usually a good deal of scratching and struggling and sometimes opposition on the part of the family, by whom it is thought that the injecting of something under the skin must be more dangerous than putting things down the throat.

Now, one other point: In regard to the question of what is to be done, after the patient gets well, with the clothing, furniture, eating utensils, handkerchiefs, and anything in the room which may have received the bacillus from the patient. Of course, it is quite a puzzle to know what to do so that we may feel certain that the room and articles used by the patient may be used by other people without danger of contracting the disease. All the clothing, bedding, and anything removable are usually put in a steam sterilizer, and for the nicer articles we now have hot-air cylinders, where these articles are allowed to remain for one to two hours at a very high temperature,—say 250° C.,—and this intense heat will kill all germ-life, but does not injure the articles. A fine laundered shirt

may be put in there, and it will come out in as good condition as it went in. But the conditions in the room, of course, still remain, and how to get into every nook and crevice of that room and make sure that we have destroyed all the bacteria has always been a source of anxiety to us. We used to go into a room with a pound of sulphur for every thousand cubic feet of space and set fire to it. and think we had done considerable, but we learned through our investigations in bacteriology that we had really accomplished very little, for, upon taking a culture of the diphtheria bacilli which had been exposed to the fumes of the sulphur the usual length of time, we found that it could grow, showing that the sulphur had no effect whatever. In addition to that, the sulphurous acid would tarnish everything unlacquered in the room and destroy the clothing, if moist. Chlorine is of no value, because it rots everything, so that for a time we were obliged to do our house-cleaning with bichloride, a solution of, say, one five-hundredth, and do the best we could; but we have recently discovered, again through the work of bacteriologists, a germicide which will destroy not only diphtheria organisms, but every other organism of disease at present known. It is by means of a simple flame from wood alcohol which passes through a sieve made of asbestos and platinum. The vapor of the wood alcohol, passing through a heated sieve, produces formaldehyde, and that, escaping into the room in certain quantities, will saturate every article there and penetrate into every crack or corner; but it must be introduced into the room in a rapid manner and in sufficient quantity, when it succeeds in killing the organisms after an exposure of four or five hours, and upon that we shall rely, probably, in the future for sterilizing, until some more effective germicide is discovered.

You must pardon me for taking up so much of your time. I hope I have not destroyed your confidence in selecting a speaker not exactly in your own profession and a subject not exactly in your line, but, as I said, it is a subject which is fraught with great interest not only to the health department but to the entire community, and I am very glad to find that you have taken an interest in it.

RELATIONS OF CHEMISTRY TO DENTISTRY.[1]

BY J. S. CASSIDY, D.D.S., COVINGTON, KY.

THE subject allotted to me for this occasion is one which I approach with feelings somewhat akin to those of the timid youth who for the first time tells the story of his love, knowing full well that the loved one possesses many attributes of rare perfection inherited from a long line of distinguished ancestors. The heroine of our story is Dentistry, and I take it that her most illustrious progenitor is Chemistry.

Investigation of the laws which were supposed to govern observed natural phenomena was one of the favorite pursuits of learned men from the earliest historic times. Reasoning from effect to cause, as time progressed, led to many useful discoveries, probably in the same ratio to intelligence and the laws of supply and demand as obtains in the affairs of this day and age.

The development of the ancient art of alchemy along practical lines was a leading civilizing influence on the people, as they gradually emerged from their simple surroundings into a clear perception of the comforts which can be obtained from changing material bodies into more desirable or needed conditions. The inhabitants of the desert of Libya were in the olden times inadequately supplied with common salt; their alchemists accordingly manufactured a substitute from camels' dung and named it "sal ammoniac," in honor of Jupiter Ammon, whom they worshipped. Herein the Arab chemists exhibited a commendable commercial spirit, whereas their Greek and Roman contemporaries labored somewhat more in the field of pharmacy by extracting from both mineral and vegetable sources numerous medicinal agents, thus balancing the mercenary by the professional spirit.

Whatever of dentistry existed in those days must have partaken of the benefits derived from the important part played by alchemy in general therapeutics. According to Dr. Ebers, many branches of science flourished wonderfully in ancient Egypt and were practised by specialists of the priestly order. "Our physicians," said the king of Amasia to his visitor, Crœsus, "are only permitted to treat one part of the body. We have aurists, dentists, and oculists, surgeons for fractures of the bone, and others for

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[1] Read before the American Dental Association at Old Point Comfort, Va., August 4, 1897.

internal diseases." By the ancient priestly law a dentist was not allowed to treat a deaf man, nor a surgeon for broken bones to treat a patient who was suffering from disease of the bowels, even though he had a first-rate knowledge of internal complaints. This law aimed at securing a great deal of real and thorough knowledge,—an aim, indeed, pursued with the most praiseworthy earnestness in all branches of science. "I came to Egypt," wrote the Sybarite, "to consult a dentist. That rude fellow Aristomachus, of Sparta, however, knocked out the defective tooth and so saved me from an operation the thought of which had often made me tremble. On recovering consciousness, I found that three teeth had been knocked into my mouth,—the diseased one and two others which, though healthy, would probably at some future time have caused me pain."

During the long interregnum between the ancient Oriental and the modern European civilization there was such continuous robber warfare and rapine that the arts of peace, outside of the quiet cloister, were not encouraged. There was no dental art worthy of the name, and comparatively little chemical research. In fact, modern chemistry as a science may be said to date its birth from the discovery of oxygen, and coincidently dental science must claim its origin as beginning about the same time. It would be superfluous and beyond the scope of our present purpose to note the advances which these divisions of human effort have made since then. They are both concomitants of higher civilization. "Show me," said Tyndall, "the country where the greatest quantity of sulphuric acid is used, and I will tell you that its people are above all others the most generally enlightened." In like manner we may say that the people of any community where dentistry flourishes are of a higher order of civilization than are those found elsewhere. My own town, by the way, contains its full quota of excellent dentists.

Dentistry is and should be cosmopolitan. It appropriates with due permission facts and methods from the humblest as well as the most exalted occupations, and in return gives back to them a large percentage of the benefits received. Metallurgy, moulding, sculpture, surgery, medicine, physics, and chemistry have been appealed to, not in vain; and as a consequence the accomplished dentist could point out to willing youth the best means of becoming experts in these separate vocations.

Of all these sciences, that of chemistry is the most universal, since it has no limitation; all forms of matter and force must own

its sway. In its domain secrecy, mystery, and charlatanism are no longer tolerated, and all who will may partake freely of the benefits it has conferred and will continue to confer in increasing ratio upon mankind.

To chemistry our profession is indebted in that it prepared nitrous oxide, by which means in after years Dr. Horace Wells, a dentist, might be permitted to introduce anæsthesia, the greatest boon ever conferred on suffering humanity. And here let me say that it does not follow that a man must thoroughly understand every department of the noble science in order to appreciate truths in chemistry which may be daily useful to him in our profession. Even a limited knowledge of the principles of chemistry enables the operator to administer that gas intelligently, knowing that nitrous oxide supersedes the normal process of oxidation in the body and prevents the ready elimination of its products, inducing thus the anæsthesia by rapid formation and retention of carbon dioxide, which fact by itself suggests the proper remedies for overcoming the tendency to asphyxia which necessarily follows the inhaling of the gas.

Dentists, as a rule, are not indifferent to nor ignorant of chemical processes, notwithstanding our friend Dr. Crouse asserted that there was not a single dentist in this country who could make an accurate quantitative analysis of any dental amalgam, whereas hundreds might be named who could do so if it were necessary. Indeed, there are many men, not professional chemists, who are able to do excellent work along lines of chemical discovery and manipulation. The recent studies of the chemical and physical properties of amalgams are of inestimable value to every dentist who thankfully takes advantage of the information derived through the labors of Dr. Black.

Moreover, not to mention the innumerable pharmaceutical preparations, our zinc oxide cements may be brought in evidence; and as some of us are sure that fillings of these materials are disposed to disintegrate more at the cervical portion than elsewhere, we also think we know the true and only cause of that unfortunate disposition, in that the part under or near the gum-margin is a favorite point for alkaline fermentation, such as the production of ammonia, resulting in the inevitable abstraction by it of the electro-negative substance of the cement. Some may be inclined to consider this brief allusion to cause and effect as "only a fine-spun theory," but it is not. It is as susceptible of proof as any problem in mathematics. We cannot, as dentists, escape, even if we so desire, the

claims of the science of chemistry upon our earnest attention and study, for on every hand we are compelled to admit the insidious influence of its affinities to be the exciting and efficient cause of the principal diseases with which we have to contend. Happily, the study of chemistry, while acquainting us with these potent influences, also points out to us, within the sphere of the same science, the means at hand to combat them most beneficently, provided we will but study and apply them.

No member of this (as the late Atkinson termed it) "Excelsior Association of Dentists" will doubt the culminating discovery of Dr. Miller, that at least lactic acid is developed in the mouth by the presence of bacteria and the materials necessary to their support, and also to the play of chemical affinities at the point of carious destruction, and, further, that the destroying agent acts molecularly with as definite results as pertain to any other natural phenomena.

Some years ago, when the so-called "germ theory" of disease was introduced, there were not a few who received the innovation with satisfaction, because they would not or could not understand, and therefore prove, the chemical theories of Watt. It is now, however, accepted beyond question that there is no conflict between the two theories that bacteria are a necessary factor in fermentation, and that their only trysting-places are in the midst of extraneous material susceptible to that process, the elements of which must obey the laws of their affinities; and if, for instance, among other compounds, destructive and otherwise, lactic acid, as proven by Miller, is developed in contact with a tooth, destruction of that part will proceed molecule by molecule, so that while it is probable that teeth, like other organs, yield to an increased, non-resisting influence of a "periodic law," dental caries is *per se* a disease of purely chemical propagation. From this latter view-point the relations between chemistry and dentistry are not of the most amicable character, notwithstanding which the science whose unseen minions are indirectly responsible for the existence of our principal enemy will inevitably furnish us with more effective weapons of defence than we as yet possess. No wonder that dentists are, perhaps unconsciously, more interested in chemistry than are the members of the mother profession; at least it would so appear by personal contact with them and by the impartial reading of medical and dental journals. One of the former (to refer to a single example) lately expressed itself surprised that any two acids could neutralize each other, and then went on to say that by mixing

one part of acetic acid and one and a half of carbolic acid a neutral compound will result. Any tyro in organic chemistry knows that phenol is not an acid, but, on the contrary, is an alcohol, and that an alcohol and an acid combined will produce an ester and water:

$$\underset{\text{Phenol.}}{C_6H_5HO} + \underset{\text{Acetic acid.}}{C_2H_4O_2}. = \underset{\text{Phenyl acetate.}}{C_6H_5C_2H_3O_2} + H_2O.$$

Perhaps the worst chemical blunder ever made officially in a dental journal occurred a few years ago in a foreign periodical, wherein the editor, with the characteristic, stupid arrogance of his kind, criticising a brief scientific description of ordinary combustion, wherein light is an essential accompaniment, mentioned the rusting of iron as his beau ideal of that process. We could forgive him for this were it not that he presumed to know it all on all questions of a similar nature.

It goes without saying, that a knowledge of certain rules in chemistry is a great aid in adapting means to ends, when anything new in that line appears, as, for instance, in cataphoresis. We were told at first that the positive pole must be used in contact with whatever drug was employed, whereas it is well known in electrolysis that the radicals or ions of conducting compound liquids separate in a perfectly definite manner, the positive radical being attracted to the cathode and the negative to the anode, so that we will likely obtain better results by selecting anaphoresis when we wish greater penetration of a strongly electro-negative radical. A duly certified list of comparative, positive, and negative classes of radicals has been known for many years, of which we are welcome to take advantage, and in return for all these favors would it not be an act of courtesy on our part to approve, when occasion permits, certain changes in nomenclature, adopted through official international committees appointed for the purpose by the most influential scientific bodies? Our journals, it is almost unnecessary to say, are editorially fully up to and are, indeed, in advance of the times; but we see too often in reports of discussions in our local societies and in some of our latest text-books names of things and terms that shock the sensibilities of euphony and truth. Take, for example, potassium iodide. Is not that name more pleasant to the ear than iodide of potash, especially when we realize that the compound contains no potash whatever? We have been surfeited for a long time with cocaine hydrochlorate, and lately with eucaine hydrochlorate, although a generation ago it was decided that acids

like hydrochloric acid (HCl), hydrobromic acid (HBr), etc., whose electro-negative radicals are elementary, confer names on salt which terminate in "ide." The final *e* has been eliminated, therefore the name of every salt of such acids should end in "id," as "cocaine hydrochlorid." It is only those acids which have compound negative radicals that give names to salts ending in "ate" or "ite," as the case may be. Sulphuric acid (H_2SO_4) forms sulphates; sulphurous acid (H_2SO_3), sulphites; chloric acid ($HClO_3$), chlorates; chlorous acid ($HClO_2$), chlorites, etc.

Life is too short to nominate for consideration at this time more than one other frequently applied word, and that word is "density." We use it, do we not, as a synonyme for hardness in the structural substance of teeth, instead of its true meaning,—*i.e.*, specific gravity? Ice is harder and more compact to a cutting instrument than is liquid water, but it is less dense. The diamond, among the hardest of bodies known, is only three and a half times as heavy as water, while pure gold is comparatively soft.

It is not possible to believe that the specific gravity of a tooth has anything to do with predisposition to disease, or even that compactness of calcium constitutes it a condition that presents a physiological barrier to decay. While perhaps these matters may appear of small practical importance, yet surely, as we claim to be devoted disciples of pure science, we have no right to trifle with accepted nomenclature.

"THE MOUTH IS THE *VIA NATURA* FOR THE ENTRANCE OF DISEASE."[1]

BY M. V. BALL, M.D.

MR. CHAIRMAN AND LADIES AND GENTLEMEN,—The mouth is the *via natura* for the entrance of disease.

When we examine the contents of our handkerchiefs we will find that a considerable amount of foreign material has been ensnared, so to speak, in the meshes of the lining membrane of the nose, and so prevented from gaining access to the lungs.

But in the mouth no such arrangement exists. We swallow the

[1] Read at a meeting of the Odontological Society of Pennsylvania, March 13, 1897.

air with our food, with the water we drink, and every time we use our vocal organs.

But not only from the air is disease—microbic disease—contracted. In the water and in the food itself many forms of infectious organisms reside, and under proper conditions develop disease.

Again, the teeth, liable to indentation and decay from use or neglect, are in such a state, like so many little test-tubes of microbe cultures, ready to inoculate the human body whenever and wherever its natural resistance is lowered. Even when the teeth are sound in every respect the spaces between the teeth become stored with food-remnants, which are liable to undergo putrefaction and act as a source of infection.

Bacteria are, as a rule, not very particular as to the source or quality of their nourishment. A minute quantity of organic material and a little moisture is, for the majority of micro-organisms, a suitable culture medium.

The refinements of the laboratory media are for other purposes than mere growth. For instance, gelatin media are useful because of the transparency and because they are readily converted into a fluid or solid state as desired. And so with agar, which is used because it remains solid at a higher temperature than gelatin, and can be used in the incubator for days without liquefying.

Only a few of the more important organisms require any particular form of food or special degree of temperature, and even these can develop, and do develop, under simpler conditions.

The natural secretions of the body, as the urine, milk, blood, and saliva, are very good germ foods, and have been artificially employed as such. Thus, one can understand why the mouth should be a favorable nidus for the culture of germs, and why so many varieties have been found therein.

The father of microscopy, and one might say of bacteriology,—namely, Antoon van Leeuwenhoek,—in 1683 contributed a paper to the Royal Society of London, describing a form of micro-organism that he discovered in the scrapings from between the teeth. We can readily understand why all of the varieties of bacteria commonly found in the air, food, and drink should be found in the mouth. And so various observers since Leeuwenhoek's time have isolated organisms from this location and given them special names.

Miller, whose work is classic, has cultivated twenty-five varieties. Biondi in 1887 described five species of pathogenic bacteria in the saliva alone. But besides the ordinary bacteria which accidentally gain entrance to the mouth, a few varieties have been dis-

covered which seem to be normally present and have their residence in and about the teeth. These have been considered as the active agents in producing dental caries and other diseases of the teeth. Recognizing the fact that bacteria of a disease-producing nature are constantly present in the mouth, it is easy to understand that when the mouth is injured systemic infection readily occurs.

Thus, the eruption of teeth in an infant is very often accompanied by severe general disturbances,—meningitis, pneumonia, convulsions, diarrhœa, and simple fever. While many writers are disposed to speak lightly of the process of teething, my own experience—not very large, it is true—agrees with that of many older writers, that the complications occurring during teething are serious and directly due to the eruption. The gums are sensitive, are inflamed, and in condition to allow the bacteria ordinarily present in the mouth to gain access to the finer capillaries. A general infection results, and we have, perhaps, only a mild form of septicæmia,—fever, diarrhœa, etc.,—or we have a specific disease, like tubercular meningitis or pneumonia. The bacteria of pneumonia are very common residents of the mouths of otherwise healthy individuals. In uncleanly people and those who fondle the child by kissing the contagion is easily conveyed.

The eruptions on the skin, the nasal and aural catarrhs, and the stomach troubles which occur during dentition can all be considered as symptoms of one disease,—septicæmia.

We are frequently called to treat abscesses in the gums and cheeks, apparently arising from carious teeth. The teeth themselves are not at fault; it is the wound or injury made in the gum by a sharp piece of food, or perhaps inflammation started by the irritation of putrefactive material, that allows the pus-germs to make their way into the tissues. Here, finding a suitable soil, they speedily develop, forming gaseous abscesses, and, consequent thereon, general constitutional disturbances.

There are a number of local diseases of the mouth dependent largely on disease-germs. Stomatitis, while somewhat dependent on bacteria for its production, is, however, often caused by other agents, and helps to produce a bacterial infection.

Thrush, the first disease found to originate from a vegetable parasite,—first described in this light by Berg, of Stockholm, in 1846,—is not a rare occupant of the mouth.

Glanders is caused by a bacillus,—bacillus mallei.

Leprosy is caused by the lepra bacillus.

Actinomycosis, by the fungus of that disease,—actinomyces.

Gonorrhœa of the mouth has been noted.

Tubercular lesions of the mouth, strange to say, rarely occur. The sputum and bronchial discharge, charged with tubercle bacilli, while known to affect the stomach mucous membrane and very often the larynx, does not act on the mucous membrane of the mouth.

The sputum has been known to be germicidal for some species. Diphtheria bacilli, for instance, are destroyed in forty-eight hours by sputum, but pneumonia bacteria thrive in it.

There are a number of diseases of the teeth themselves which are supposed to lead to serious trouble in the maxillary bones; as, for instance, various inflammations of the pulp and cement. A number of investigators seem to find specific germs which cause dental caries.

As early as 1867 Leber and Rottenstein made public the theory that leptothrix penetrated the dental canal, dilating it, and in connection with acid destroyed the substance. It was thought that the sound enamel could be entered by the bacteria, but Miller proved that this was impossible and that the germ first produced an acid, which, by softening the tissue at some point, allowed the bacteria to enter. Ordinary mouth-fermentations produce sufficient lactic acid to act on the teeth. This fermentation itself is the result of acid-producing bacteria which are constantly present in the mouth. There is no organism that can be said to produce dental caries. Any acid-forming germ—and there are many varieties—can give the first injury, and once the enamel is attacked, caries is certain to follow. The affected tissue then becomes filled with cultures of bacteria, and six species have been isolated from the dentine by Gallipe and Vignal.

It seems more reasonable to suppose that dental caries, like decay of many other tissues, can occur under the influence of pus-forming organisms of various kinds.

The ordinary pus-germs are constantly present in the air, and therefore found very often in the mouth. Miller found the sputum of one hundred and eleven students fatal to mice in one hundred and one cases, and septicæmia was produced in nearly all the animals.

The dental caries in itself serves as a focus of disease. Glandular enlargement, especially of the neighboring lymphatic glands, is usually present. The wound, for such it really is, is in constant danger of infection by any of the more dangerous organisms that accidentally find lodgement in the mouth. It is not unlikely that

diseases like acute rheumatism, endocarditis, meningitis, and even tuberculosis might arise through this entry. By rubbing vigorously a culture of the staphylococcus pyogenes aureus into his healthy arm one experimenter caused a number of boils to appear.

A local tuberculosis has resulted on the fingers of persons handling consumptives, when such fingers were injured. The ordinary scrofulitic swellings of the cervical glands which are so common in children are to-day believed to be tubercular,—local tuberculosis. Caries of the teeth, allowing the tubercular bacillus of the streets and of the food to gain entrance into the exposed lymph-channels, can thus cause the infection of neighboring glands.

Acute rheumatism, while not known to be dependent on a specific organism, is, however, so intimately associated with endocarditis, which itself is so often caused by the pneumonia bacteria, that it is not too far out of the way to consider rheumatism as probably of microbic origin.

There are probably predisposing causes, but the entrance of germs through the defective teeth is not to be overlooked. I have mentioned dentition as a condition during which the infant is peculiarly susceptible to microbic diseases. Convulsions are probably due to a sudden intoxication by the product of some virulent organism, the onset and termination are so much like an acute toxæmia.

Although in typhoid fever the tongue and teeth are very much affected by the accumulations on them, commonly known as sordes, yet the abscesses which often arise during convalescence originate probably through the intestinal lesions, and not from the mouth.

Of course, any foreign agency which injures the membrane—as, for instance, plates, artificial teeth, and so forth—establishes the same conditions for the entrance of disease as before considered. And the extraction of teeth is a surgical operation open to all the dangers of infection as much as any other operation. Until the wound made is healed, it seems to me, it should receive the same careful consideration as any other wound artificially produced in the mouth. Not only is it an open wound, but it is a wound continually exposed to the worst sort of infection. Unfortunately, I have not gone into this subject as studiously or carefully as it merits, but I trust that some thought may be aroused by the few facts here cited which will induce discussion and further research.

EXAMINING BOARDS.—AN OPEN LETTER.

Dr. B. Holly Smith, Baltimore, Md.:

Dear Doctor,—I have read carefully and with much interest the Pennsylvania act you furnished me for perusal, and will avail myself of this, the earliest opportunity, to express to you my convictions on the subject. I must be frank with you, and will say in all candor that my views and feelings are not in sympathy with the wording of the law as a whole.

The first and one very serious objection is this, that it will tend to strengthen and perpetuate dental examining boards beyond, in all probability, a period of usefulness, and the reform and good they were designed to accomplish in the interest of dentistry as a profession and suffering humanity.

When dental examining boards were created it was deemed essential, as a stimulus to dental college faculties, to be more exacting and stringent with candidates for graduation, that they might send graduates forth to practise better qualified than by the prevailing custom.

That in part has been accomplished, and the evidences are very perceptible and gratifying. The good work accomplished justifies hope for future development of progressive good results on a higher plane of action. So perceptible is the improved work in college laboratories, operating- and clinic-rooms, that the question now arises, Is there further need of such organizations? May not abuses be indulged and harm rather than good come to the profession at large?

Holding to the views I do, believing it to be the duty of dental college faculties to prepare students for graduation and practice for the benefit and satisfaction of the public, I also honestly believe that dental college faculties, as a whole, are infinitely more competent and better prepared to judge of the qualifications requisite for successful practice, and ultimate rendering of good service to the honor and credit of the profession, than are the majority of dentists who compose dental examining boards.

With these convictions I cannot advise nor sanction the continuance of such organizations. So far they have served a reasonably good purpose, have aroused thought and action, and doubtless have stimulated college faculties to a livelier sense of the distinguished responsibilities that rest upon them, and to the extent that it is now recognized and realized fully that they are doing more thorough

work in course of preparation of dental students for graduation and successful practice, and in all probability will increase in united effort for completeness of work that will fully meet the general demand. In the course of a few years the universal college curriculum will be such as to satisfy perfectly the profession and the public, and there will be general proclaim that there is no further need of examining boards, and that a diploma from any accredited dental college in this country shall permit the possessor to open office and practise without question or hinderance in any State or special locality within our broad domain of territory.

Then examining boards, after having done some good (for which credit is due) and dispensed considerable injustice, will be a thing of the past. At present, under the existing state of things, colleges are weakening, and any one of these at any time is liable to be brought into disrepute by one prejudiced, scheming manipulator on an examining board. There are good men and competent on these boards, but they do not always have the control. Not only colleges are liable to suffer injustice, but young graduates of true worth and fair attainments experience unjust treatment and have no redress.

Men selected to compose the boards are not always the most competent and best suited in all respects for the honorable position, and such being the case, the ruling is as apt to be for evil as for good, as actions are not always based upon strict principles of equity and justice. It is not unfrequent that young graduates of true merit and well prepared to begin practice are rejected, and there is no immediate means for reversal of decision, and the humiliation and mortification must be endured for a year at least.

In some States for several years past a rejection by examining boards of one-fifth or more of all applicants for license to practise has prevailed, and so it is with medical examining boards. This is unreasonable and wrong, and sometimes criminally unjust, and should be checked and righted, and the sooner it is done the better for the elevation and dignity of the dental profession. If the present order of things is not dealt with and checked there will soon be a marked retrogression in both professions.

State dental schools, appendages to universities and colleges, with chartered rights and privileges and very few advantages, will be the order of the day with the dental, as is now prevalent and rapidly increasing with the medical profession, and very naturally a weak state of things will follow, with no upward tendency whatever.

The creation of examining boards was designed for general good, strengthening and advancing the profession in public estimation, and to "guard the public" (so proclaimed) against empiricism and incompetent practitioners,—motives very commendable, but almost a feature of too much unselfishness to continue and prove effective and beneficial. We are all by nature more or less selfish, and when latitude is given, as in the case of examining boards, the selfish feature will assert itself occasionally, and sometimes it is difficult to keep it in check, as evidenced by expressions like these: "We must put on the brakes and stop this wholesale graduating; the whole country will soon be flooded with young dentists; there are too many now." What meaneth such expressions? I pronounce them unworthy of the source from which they emanated, and are weakening to organizations designed for good.

Time has developed the fact that the good for which examining boards were designed has not been accomplished in full, and in all probability never will be. Purifying is requisite, and the remedy is not in sight to justify contention for further existence of these. If the present course be persisted in much longer it will, in my judgment, prove seriously pernicious, and dental colleges will be regarded as of but little importance, and any faculty will be subject to the prejudices and whims of undeserving, domineering men on these boards.

All must confess, and it is to be regretted, that some dental colleges (owing chiefly, I believe, to the great increase of numbers and striving for patronage) have been too indifferent about qualifications and right preparation of young graduates to commence practice, and have graduated and turned loose upon communities incompetent men, some that never can practise with skill and credit to the profession and justice to the public. But such cases proportionately are small, unquestionably the exception, and not the rule, —a feature in all professions, and not more frequent or common with dentistry than medicine, law, and the sacred ministry; none exempt.

We must not be too exacting. Let us try to be charitable, generous, and hopeful, trusting strength may come of weakness, good of evil, and if we fail occasionally to realize the results desired and hoped for, we will be sustained through the satisfaction of knowing we erred on the side of charity and humanity, with good intentions for general good.

Examining boards seem to lose sight of the fact that when they reject and stamp an applicant for license to practise as incompetent

and unworthy, it is a life-mark and stigma that time will not erase, and often with sensitive natures will be keenly felt through life.

It is possible that many young men of true worth may feel the sting of injustice so severely as to be deterred from making further effort, who, if favored and encouraged, as they should be, by older men in the profession, would in a few years become skilful operators, and truly merit confidence and praise as trustworthy practitioners.

In our zeal and ambition for a higher order of things (professional), we must not lose sight of the experiences of the past. Evolution is safer and grander for profitable and enduring results than revolution.

We, as a profession, are considerably presumptuous when we assume to contend for an advance and higher grade of attainments, skill, and practical excellence to begin with, than medicine, law, and the ministry. It is commendable to be ambitious, but it is wisest and best not to make haste to get ahead too fast.

Just think of the many men recorded, and some we have known and are now living, when commencing the practice of dentistry, medicine, law, and the ministry, what weakness, seemingly, and what little hope for them, and what a poor prospect for good to mankind through their labors; but time developed that there was will-power, manhood, and tact, backed by ambition and perseverance, which are moving factors in life-work that will accomplish much, and developments that will surprise and delight us.

Dental colleges should prepare students for graduation and to be able to begin practice. Time, application, and experience will develop and determine the possibility of attainments and manipulative ability.

We have no right to demand of colleges that every graduate just possessed of his diploma shall be a skilful operator or manipulator in any branch of the profession and well versed in the theory of dental science, and able to treat diseases and perform all operations within the range of his professional province as creditably and satisfactorily as after a five years' experience. Such a demand is unreasonable and unjust.

I will suggest to examining boards, and all who advocate their remaining longer than there is necessity for their existence, this fact, that many men now engaged in successful practice of dentistry and medicine, and are acknowledged to be first-class practitioners, are men whose advantages for preliminary education were extremely limited, and the advantages afforded them at dental and medical colleges very meagre compared to those of the present day.

But such men, often friendless and cramped by poverty, were richly endowed with will- and brain-power, and said silently to themselves in their struggle for advancement and usefulness, All I ask for and want is a fair chance and a fair race. It was granted, and should be to all such now, and victory and enviable reputation has been the reward.

Higher education is desirable and is needed on every line of life action, and it is coming quite as rapidly as will be for the good of a people. In educational matters, as in other affairs of life, slow progress, but steady and sure, is wisest and best. In climbing the ladder of life, professional or otherwise, one round at a time is safest and surest for reaching the top successfully.

We realize from observation a developed and unquestionable fact, that it is not always the case that the best educated men are the most progressive and useful and most successful, as a whole, in professions or any vocation, and are never the most inventive and faithful, persistent workers. Examining boards are clamoring for too much rapid advance at short notice, some of them forgetting their misfortune and needs in early life, and their very great disadvantages in the beginning of their early professional career.

Thorough professional knowledge and excellence in manipulative skill is not the work of a few months or years. Preparation to commence the effort for those higher and desired attainments is all that should be required or expected of young men who have just graduated and are ready to commence practice.

This great country of ours is a republic. We boast of it, and are proud of her institutions and the guaranteed equality of rights. If we are honest in our professions, we must sustain and perpetuate them in principle and purity, and must do nothing through false ideas and false ambition and pride to assist and elevate one class and lower and depress another.

The time has not yet arrived, but is far distant, I hope, when (if ever) in this blessed land none but the fortunate and specially favored need hope for and anticipate admittance to membership and honors in the dental profession. Should such a state of things ever occur, then there will be rapid deterioration, and dentistry as a profession will tend downward rather than upward and onward.

For progress, strength, and highest order of attainments all must feel and fully realize the equality of right and privilege to make effort and strive for the highest mark and prize attainable, and that the race is open to all, and there will be no prejudices of favoritism indulged, to the disfavor or favor of any. With such pro-

visions of privilege, the stimulus will be great, and the competition and nobleness of struggle and effort put forth will be more exalted and meritorious and humanity better served; professional men will think better of themselves and will be better thought of. We must be just, humane, and honest, and lose sight of self as best we can when acting "in the interest of the public."

Education in our country is on the increase, and in every section provision is being made for higher grades for all classes, and good will come of it; but for best effect the process must be slow, the slower in reason the better, that all may enjoy equal chances for benefit and the whole be blessed thereby.

In place of examining boards I will suggest that each State create a board of censors, to whom shall be reported any and all cases of malpractice or improper professional conduct, and before whom the accused may and shall confront his accusers, and, if convicted, shall be suspended or barred the privilege to practise in the State in which the offence was committed; and the secretary of the board of censors shall be required to report proceedings and ruling, with seal of office, to every other board in the several States, who shall place on file and furnish copy to secretary of State dental association or society, to be read at ensuing meeting. By such a procedure the unworthy could be rightly dealt with and the public protected more securely and the profession sustained better than by the present provision and arrangement of examining boards.

B. F. Arrington.

Goldsboro, N. C.

Abstracts and Translations.

FORMALDEHYDE.

BY H. C. WOOD, M.D., LL.D., PHILADELPHIA, PA.

The gaseous body known as formaldehyde, formyl, or formol, has been sufficiently studied in the laboratory to indicate that it is a very valuable addition to our practical medicaments. Owing to the efforts of an enterprising firm of pharmaceutical chemists it is chiefly known by the profession as formalin. Formalin is, however, an aqueous forty-per-cent. solution of formaldehyde, protected by a trade-mark name, and therefore loaded with all the excess of price, etc., which are of necessity associated with proprietary remedies.

We know of no reason, however, why doctor or patient should pay this tax, and as the demand grows, various solutions of formaldehyde will probably be put upon the market. Indeed, under the name of formaldehyde, Merck & Co. to-day sell an aqueous solution at the rate of seventy-five cents a pound, including the bottle; the corresponding price of formalin being eighty-five cents a pound, also including package; so that by purchasing the solution of Merck there is a saving of over twelve per cent. For the purposes of calculation and production of strength, a fifty-per-cent. solution would be preferable; but it appears not to be permanent, becoming after a time turbid.

As long ago as 1888, Trillat discovered the germicidal powers of formaldehyde, and in a tabulated statement of the results obtained by numerous observers, Marion, in 1895, showed there was a widely founded consensus of opinion that 1 part in 20,000 of the gas would kill most bacteria if the contact were prolonged. Most observers agree in stating that the germicidal power of formaldehyde is equivalent to that of corrosive sublimate; but later reports (as those of Walter, made in 1896) indicate that while it is many times stronger than carbolic acid, it is inferior in strength to corrosive sublimate, and that a contact of one hour is necessary for the destruction of *all pathogenetic spores* by its one-per-cent. solution. A very important observation is that of Aronson and Burkhard, according to whose experiments this substance is not merely germicidal, but has the power of stripping the toxins of diphtheria, of tetanus, and probably of other diseases of their poisonous powers.

The action of the drug upon the higher animals is comparatively feeble. Trillat states that sixty-six cubic centimetres of it per kilogramme are not fatal to the guinea-pig, although the urine passed by the poisoned animals is incapable of putrefaction; while no pronounced symptoms were produced in the rabbit by the injection of thirty-eight centigrammes per kilogramme. According to Mosso and Paoletti, fifty cubic centimetres per kilogramme injected hypodermically into the dog caused a progressive poisoning, with fall of temperature and death after many days. The same amount given by the stomach produced rapid effects, with violent convulsions, general rigidity, salivation, stupor, unconsciousness, and death. A curious fact was noted,—namely, that the drug was much more poisonous when taken by the stomach than when taken hypodermically. This is evidently connected with its intense irritant properties. It is probable that it causes a severe gastro-enteritis; and it is possible, especially as deep eschars have been noted following

the hypodermic injections, that when it is injected into the cellular tissue the local effects may interfere with absorption. Small doses have been found by Mosso and Paoletti to increase the blood-pressure, probably by causing peripheral contraction of the arteries, while the large doses depress the circulation, and so act upon the blood that it coagulates with the separation of a dark-red serum.

The gas formaldehyde is exceedingly irritant, and it has been noted by Mosso and Paoletti that free inhalation is liable to produce severe pulmonary inflammation, ending, it may be, fatally.

Thus far formaldehyde has been used in practical medicine,—chiefly, first, as a preservative; second, as a germicide and disinfectant. In the anatomical laboratory it has been largely employed, and is, we believe, highly considered by most anatomists. Dr. Holmes, the university anatomical demonstrator, informs us, however, that a three-per-cent. solution will not keep bodies unless they are completely immersed in it, parts floating above the liquid rapidly drying and being destroyed by mould; also that the brain in its interior softens and putrefies in such solution. According to Professor Orth, the addition of a ten per cent. of a forty-per-cent. solution of formaldehyde to one hundred parts of Müller's solution greatly increases the preserving and hardening action of that solution. As, however, the compound solution begins to decompose in two days after its mixing it must be made freshly at the time of using.

The chief interest to the general profession, however, of formaldehyde centres at present in its powers as a germicide and disinfectant, and it looks as though it would, for all ordinary purposes of the hospital and sick-room, replace other substances. Hitherto there has been no practical method known of disinfecting apartments. A peculiarity of the gas formaldehyde is its power of penetrating not only animal tissues, but almost all organic substances, so that Van Ermengen and Sugg, in 1895, demonstrated in an elaborate series of experiments that it is possible to sterilize books by means of formaldehyde in an approximate quantity of five cubic centimetres to one litre of air; while in our own University Laboratory, Horton, in 1896, showed that books infected with various pathogenetic germs could be disinfected by being shut up for fifteen minutes in an atmosphere containing the vapor of commercial formalin, one cubic centimetre of the formalin to three hundred cubic centimetres or less of air. The method of Trillat, however, is without doubt greatly superior to evaporation or pulverization of the solution of formaldehyde.

It consists in the use of the formaldehyde directly after its production by the passage of the vapors of methylic alcohol over red-hot metal. Employing a very ingenious apparatus devised by himself, Trillat proved that it was possible to completely disinfect rooms and the furniture contained therein by the consumption during six hours of from four to six litres of methylic alcohol for each three hundred cubic metres of the room.

In the very recent (January, 1897) report of an elaborate series of experiments, Dr. J. J. Kinyoun, of the United States Marine Service, has confirmed all the statements of Trillat; and has further shown that none of the ordinary fabrics are injured by the gas, which is entirely capable of completely disinfecting curtains, carpets, clothing, bed-covering, and the minor forms of furniture, although it is doubtful whether heavy upholstered furniture, such as sofas and mattresses, can in their interior be thoroughly disinfected. Nevertheless, he did succeed in killing germs underneath ten layers of blankets.

There is at present offered for sale in the markets of the United States several forms of formaldehyde lamps, which, we believe, are all adaptations of the Trillat system, and are probably all of them efficient. We have known influenza apparently put an end to in a house where cases were continually recurring by its use, and the time seems not far distant when some such apparatus will be owned by every physician and used always in private practice where there has been germ-disease. The formaldehyde is so irritating that no one can stay in the room during the disinfection; but the apparatus is automatic and can be left to itself. Rooms can undoubtedly be disinfected by pulverizing in them with steam atomizers formalin or other solution of formaldehyde. There is, however, no reason for believing that the results obtained with formalin are better than those obtained with the gas formaldehyde; probably they are not as good. The expense with formalin is very many times greater than with formaldehyde. Thirty-two grammes of methylic alcohol theoretically should yield thirty grammes of liquid formaldehyde, as that compound exists under the influence of intense cold or under pressure. This amount of the liquid formaldehyde at ordinary pressure and a temperature of 60° F. should make 23.4 litres of the gas formaldehyde, the form in which the substance usually exists. Calculating this out, it will be found that one pound of methylic alcohol should yield three hundred and fifty-five litres of formaldehyde gas, or about four hundred quarts, or about one hundred gallons. As pure methylic alcohol is listed by Merck at one dollar

and nine cents a pound, theoretically there should be obtained for one dollar and nine cents as much of the vapor as exists in two hundred and fifty gallons of formalin, a substance listed at eighty-five cents a pound. Even supposing that thirty per cent. of the methylic alcohol is wasted in the practical making of the formaldehyde, it is plain that the cost of the vapor is many times less than of a corresponding amount of formalin.

Formaldehyde has not as yet been fully tested in practical surgery, but there is sufficient knowledge to indicate that it may prove to be the best of the known germicides. The taste of it and the irritant quality of the solution, along with the feebleness of its toxic properties, make serious accidental poisoning by it very improbable; and also make still more improbable, practically impossible, any fatal results parallel to those which have been so frequently produced by the surgeon when by the too free use of corrosive sublimate or of carbolic acid he has caused the death of the unfortunate patient, a result, in our opinion, which has been far more frequent than is generally admitted.

It would appear also that formalin is not only a germicide, but will so act upon various organic materials as to remove bad odors; at least, according to Walter, a one-per-cent. solution will almost immediately and entirely deodorize fæces. For the cleansing of vessels in the anatomical laboratory the one-half-per-cent. solution of formaldehyde suffices, but for most purposes in the clinical amphitheatre the one-per-cent. solution may be used. According to Walter, washing the hands with it and afterwards with alcohol renders them completely antiseptic, while it does not stain and appears not to irritate more than the other antiseptic solutions used. It is stated that it does not in any way affect instruments, so that its use is superior to the method of boiling as commonly practised, because it leaves the edges of the knives undulled. We are also informed by surgeons that it affords a very efficient means of preparing catgut.

It seems to us probable that by the use of the gas itself many of the tedious procedures at present connected with heating in the preparation of surgical dressings may be avoided. All that would probably be necessary to do would be to connect the nozzle of a formaldehyde-forming lamp with the copper or tin vessel containing the dressings, so as to allow a current of the vapor to pass freely through in order to completely sterilize the dressing. Experiments are necessary, however, to show how far what seems probable *a priori* would endure in practice.

There appears to be little doubt as to the great value of formaldehyde as a local application, although its full powers have as yet been scarcely made out, while there appears to be no danger of poisoning by it, although its solution, if used too strong, is liable to produce excessive irritation of the sound tissues. In the University Hospital, as well as in the Presbyterian Hospital and in private practice, Professor Willard has used formaldehyde in all sorts of wounds, in carbuncles, and in various infected sores. For washing out and purifying an infected wound he employs a two-per-cent. solution. For a continuous local application, or for free irrigation, a quarter of the one-per-cent. solution; and while the effects upon suppuration and the general evidences of infection have been very pronounced, in no case has there been any local irritation. Professor von Winckel, of Berlin, reported to the gynæcological society of that city that he had found the agent extremely effective in gonorrhœal vaginitis and other infective diseases of the female genitals; and that while a four-per-cent. solution of formaldehyde could often be painted with great and immediate advantage upon the cervix or other diseased part, 1 part in 10,000 is effective by the method of irrigation. It is very probable that strong solutions of formaldehyde will be found to be a very valuable remedy in the treatment of chancroids, poisoned wounds, etc. Of course, these strong solutions should be used at first tentatively, and always as though they were mild caustics.

A suggestion, which we throw out for the testing of surgeons, is whether it be not possible by means of the simple formaldehyde-lamp to immediately disinfect wounds by allowing the vapors of the formaldehyde to be discharged for a few moments into the wound. The penetrating character of these vapors is such that *a priori*, at least, it appears probable that they would penetrate into the recesses of the wound much better than would a liquid solution. In bad cases of peritonitis, with the whole abdominal surfaces infected, it is notorious that laparotomy, although frequently practised, is almost invariably followed by death; but here again the possibilities of rapid disinfection and purification by means of the gaseous and seemingly scarcely toxic vapor appear to open out a possible avenue of safety. The momentary irritation of the peritoneum would probably not be severe enough to create serious shock; while our present knowledge indicates that it would interfere with rather than increase septic absorption.—*University Medical Magazine.*

Reports of Society Meetings.

AMERICAN DENTAL ASSOCIATION.

(Continued from page 660.)

August 4, 1897.—Second day.—Morning Session.

THE meeting was called to order by President Truman at a quarter to ten o'clock.

The Secretary read the minutes of the previous session, which were approved. The Secretary also read a letter from S. B. Hartman, regretting that he cannot be in attendance, and sending his good wishes to the American Dental Association and the Southern Dental Association.

The Secretary read a resolution from the Southern Dental Association inviting all members of the American Dental Association (upon presentation of a card to be signed by Dr. Cushing) to attend clinics given by the Southern Dental Association. The invitation was received with thanks, and the Secretary was instructed to send a return invitation to the Southern Dental Association to attend our meetings and be granted the privileges of the floor.

COMMITTEE ON CREDENTIALS AND ETHICS.

Dr. Jackson reported that the committee had audited the accounts of the Treasurer and found them correct. The committee also reported that at the last meeting charges of unprofessional conduct were preferred against Dr. Horton, of Cleveland. Dr. Horton having received notice of such charges through publications and having made no defence, the committee recommend that his name be dropped from the roll of membership. A motion was made to such effect and carried. The committee has also audited the Publication Committee's account and found it correct.

Report accepted.

Dr. Crouse.—According to the programme as printed, Dr. Harlan was to give the annual address this morning. He is not here, and I move that we substitute in place of that Dr. Cassidy's address.

Motion carried.

The President.—Dr. Harlan wrote me some weeks ago that it

would be impossible for him to be at this meeting, but his letter came too late to appoint any one in his place.

Dr. Cassidy, of Covington, Ky., then read a paper entitled "Relations of Chemistry to Dentistry."

(For Dr. Cassidy's paper, see page 719.)

DISCUSSION.

Dr. Barrett, of Buffalo.—I should be happy to discuss this question if it were not mainly devoted to a field which I have not cultivated. I am all at sea upon the mistakes to which Dr. Cassidy has called attention. We are ambitious to be known as educated men. We claim a scientific standing, and yet some of our representative men cannot spell correctly. Sometimes the most ludicrous blunders occur in text-books and publications, and I am very glad indeed when a man of some erudition calls attention to our shortcomings. We get on the fence, flap our wings, and crow, and we do not see the insecure foundation upon which we stand. I never learn anything from the man who says I know it all and substantiates everything I say; but I do learn from the man who shows me that I am mistaken, who tells me I am wrong, and proves it. I shall read the paper and make a study of it.

Dr. Peirce, of Philadelphia.—I wish to express my great pleasure in the paper. It was instructive to me, and one which is true in its scientific conclusions.

Dr. St. George Elliott, of New York.—I would like to ask Dr. Cassidy what his views are in regard to Dr. Black's statement. The Institute of Stomatology, of New York, sent out circulars to a large number of dentists within the past few weeks, asking their views on Dr. Black's statement that the density of a tooth has nothing to do with its tendency to decay. The answers have not yet come in, but I would like Dr. Cassidy's view.

Dr. Cassidy.—It seems to me we know nothing about the density of a tooth. It is the specific gravity, compared to the weight of the tooth; therefore the density has nothing to do with the decay. The hardness and compactness may, of course, have something to do with it. If Dr. Black meant density in its true meaning, of course he is correct.

Dr. Elliott.—Dr. Black states distinctly that in speaking of density, he did not consider the hardness to cutting instruments. That seems to explain the whole thing.

Dr. Taft.—I am very glad and proud that we have men in our profession who can consider these subjects as the author of this

paper did. Papers like this enter upon the marrow and pith of the subject involved, and I think this body would do well to encourage such efforts by any aid in their power.

Dr. Smith.—I can only commend the paper. Those of us who know Professor Cassidy, know that in making a public statement or reading a paper, he is careful to be on solid ground. He spoke of the manner in which cement fillings disintegrate at the cervical border. We often hear at meetings of associations that cement fillings stand just as well at the cervical border as they do anywhere in the cavity. Dr. Cassidy accounts for the dissolution at that point by the development of the alkaline reaction. If that be correct, all the statements made by those who make permanent fillings which stand at the cervical borders and under the gum tissue must be very far wrong. Only lately a gentleman said that if his fillings failed at all, it was away from those borders. We have a development of ammonia, and that will dissolve any cement filling.

Dr. Patterson.—We know the dread with which students in colleges approach the study of chemistry. Why it is so I can scarcely tell, unless it is that we have no dental teachers of chemistry. It has been found by me that those students who come into our colleges as graduates in pharmacy are the best students we have. They make splendid dentists, and we are glad to accept them; and when the National Association of Faculties gave the graduates in pharmacy credit for one year they did a good thing. I would like to say a word in regard to the disintegration of oxyphosphate fillings at the cervical border. If it is proved by experimentation that those fillings will and do disintegrate from alkalinity at that portion of the filling, then Dr. Smith's statement and that of Dr. Cassidy may be substantiated. I have made many experiments along that line, and I will say that they do not, if properly mixed in alkaline solutions, disintegrate at that border or any other border perceptibly. If you can do out of the mouth what you do in the mouth, any alkaline solution that is found in the mouth will not affect an oxyphosphate filling properly made. I am not a chemist myself. The only thing I can say is, what I have tried with acid and alkaline solutions, and if you will try it you will come to the same conclusions practically as I have done.

Dr. Smith.—I did not expect to make this issue, but I doubt very much if you can produce the conditions outside of the mouth that you get in the mouth. I have made my best efforts with that material, and the portion that rises above the cervical edge will be intact when the other is destroyed, because we have deposited

at that line the foods, which in fermenting produce an alkaline reaction. The conditions at the cervical border are such that fermentation takes place. Those conditions cannot be produced out of the mouth, and a test out of the mouth would not be proper. Let me appeal to every member present if it is not true that many times, if the filling fails at all, it is at the cervical border. We can give no assurance of permanency, especially in a mouth which is neglected, and where we invariably have a reaction.

Dr. Barrett.—Dr. Smith says the fermentation is an alkaline one.

Dr. Smith.—I should have said putrefactive one.

Dr. Cassidy.—That is a distinction without a difference, as I understand it. Putrefaction is an alkaline fermentation, while what we call fermentation is of an acid nature. Vinous fermentation is also of an acid nature. All forms of fermentation, as we restrict the term, mean that we end with an acid,—acetic acid, etc. Putrefaction is used to indicate fermentation of nitrogenous matters which produce ammonia and its derivatives. Dr. Patterson says he has experimented out of the mouth with oxyphosphate cements. So have I; but the actions that occur in the mouth prove certain facts. If we acknowledge, as we must, that ammonia is developed by alkaline fermentation or putrefactive fermentation, we must acknowledge that ammonia is developed in the mouth, and I must say that oxyphosphate filling, prepared carefully, placed in a tooth out of the mouth in a dry condition, and allowed to stand in a dry place over night, if placed in a five-per-cent. solution of common ammonia in water (which is really about a one-five-thousandth solution), the next morning you will find the filling has all disintegrated, the oxide of zinc will be a precipitate, and phosphoric acid will have united with the ammonia. If we acknowledge that ammonia is developed in the mouth, this will take place in oxyphosphate fillings.

Dr. Barrett.—I am glad to have the line drawn so closely between putrefaction and fermentation. Putrefaction is destructive fermentation with the evolution of offensive products, due to the nitrogenous product which is present. While both are essentially the same products, they are different classes; still, they belong to the fungi family, while inorganic products are of a different character. I am glad Professor Cassidy explained the difference between the two, for there has been a great deal of confusion in regard to it.

Dr. Smith.—I would like Professor Cassidy to make a little more clear why it is that these fillings disintegrate more at the border

than at the other points. Why do we have more fermentation at that point?

Dr. Cassidy.—The finishing of the filling has a great deal to do with it. When a filling is finished under the margin of the gum and a little roughness or imperfection is allowed there, which is more apt to be the case at that point than elsewhere, it sets up irritation and inflammation of the soft part of the gum or any of the tissues where inflammation occurs. Inflammation is concomitant with the process of fermentation called putrefaction, and the characteristic or typical ending of putrefaction is ammonia or some of its derivatives. The ptomaines, for instance, are derivatives of ammonia, and develop at that point probably more by the inflammation than by the *débris* that might be lodged there.

Dr. Barrett.—I call attention to a white, cheesy deposit, with which, no doubt, Professor Cassidy is familiar. That seems to account for the thing. It is found at the gingival margin upon the teeth.

Dr. Peirce moved that, as Dr. Case is obliged to leave, Section I. take precedence of Section VI., and Dr. Case read his paper next. The motion was carried, and Dr. Case proceeded to read his paper.

Dr. Case.—Part of the paper that I am about to present was read at the last meeting of the Illinois State Dental Society, especially the part that refers to the fundamental principles of force. As explained at that time, I have continued the paper to its present state. My object and desire in presenting it here is to give it before as large a number of dentists as possible. It has reference largely to the teaching of orthodontia, and I hope to receive a fair discussion and criticism of its merits, that I may be able to eliminate the errors which it may contain.

An abstract of Dr. Case's paper follows:

PRINCIPLES OF FORCE AND ANCHORAGE IN THE MOVEMENT OF THE TEETH.

BY C. S. CASE, D.D.S., M.D., CHICAGO, ILL.

If there is one thing more important than another in the science of regulating teeth, it is a mind that is well trained in the simple laws of physics, with the ability to practically apply these laws to the invention, construction, and management of regulating appliances.

In the voluminous literature and teachings upon the subject of

orthodontia and dentistry in general there is little to be learned of these most important basic principles. In our endeavor to become a great profession and completely dissociate ourselves as professional men from the fearful calamity of being classed as tradesmen and mechanics, there has been an unfortunate tendency to underrate the value of certain branches of knowledge that lie at the very foundation of dentistry, and which should form the only true basis to scientific training for almost everything we undertake as dentists.

In my teachings I dwell at considerable length upon the laws which govern force and the mechanical advantages of different methods of applying it in the practical movement of teeth. I treat a regulating apparatus, together with the teeth to which it is attached, as a machine. The best definition of a machine is that it is an instrument introduced between a moving force and a resistance with the view of changing the direction of the force or otherwise modifying it. In that branch of my teachings entitled "Construction of Regulating Appliances, and their Management," I endeavor to arrange the work systematically, according to the distinct mechanical principles involved in the scientific application of the required force. I divide the whole subject under this head into two general divisions, entitled respectively "Action" and "Reaction." Under the head of "Action," which pertains exclusively to the movement of malposed teeth to the direct action of force, I take up, first, the movement of crowns in every direction; second, the movement of roots in every direction, with or without the movement of their crowns; third, rotating or turning the teeth on their own axes; fourth, intrusion and extrusion, or the gradual forcing of teeth in or out of their sockets.

The second main division of the work, entitled "Reaction," pertains to the management of the opposing force,—action. This I divide into, first, reciprocating or movable anchorages, describing methods for utilizing the force of reaction in the movement of other malposed teeth, and, second, stationary or static anchorage appliances. I do not mean by this that I confine the teachings of this work to a single branch at a time, to the exclusion of all others, but I endeavor to blend them into each other, illustrating the principles as I progress with practical cases.

In contemplating the construction of a molar anchorage appliance that will permit the least possible movement of the included teeth, the principal object should be to so construct the device that the great tendency of tipping of the crowns will be prevented. If this be fully accomplished and the tooth or teeth are

held in an upright position, the applied force will be evenly distributed over the entire anterior or posterior surfaces of the alveoli for all the roots, increasing the stability of the anchorage to an incalculable degree. If the appliance is loosely attached to the teeth or permits the slightest hinge-movement, as would arise from a removable attachment or a single uncemented band that encircles two or more teeth, there would be nothing to prevent this tipping tendency, though such an anchorage might be sufficient for many purposes, if it is attached to a sufficient number of teeth, and the applied power is always less than their combined natural inertia. An instance frequently arises in the regulation of teeth where it is eminently desirable to obtain an anchorage of the greatest possible stability. When considerable force is required to reduce an irregularity, two or three teeth should be included in the grasp of the anchorage appliance. The addition of a second tooth to the anchorage will not only double its stability but incalculably increase it by the support which the two teeth can be made to give to each other by proper construction of the appliance.

In its construction, German silver or platinized gold bands should be selected that are six- to ten-thousandths of an inch in thickness (or Nos. 34 to 30 B. & S. gauge) and as wide as the teeth will permit. When these are soldered and properly contoured to perfectly fit the crowns, take a plaster impression of them in position, after which carefully remove the bands, place them in the impression, and fill with Teague's or any good investing material. This will hold them in proper relative position during the soldering process. Solder should be flowed between the bands, uniting their approximal surfaces and filling the V-shaped spaces on every side. To more perfectly reinforce the stability of the appliance, fit and solder to the lingual surfaces a flattened piece of No. 16 wire, after which the tube or tubes are to be attached for the power bars or traction wires for the movement of the anterior teeth. In attaching the tubes the advantage of applying the power as near to the gingival margin as possible should be remembered. When such an appliance is fitted and cemented to the teeth, it will hold them rigidly in its grasp, in an upright position. If the bands are thin and narrow or the apparatus is not sufficiently reinforced by the solder and otherwise, the slight yielding of the material under great strain will allow the teeth to tip and soon break loose from their attachments.

Instances frequently arise where only one tooth can be used for an anchorage on one or both sides of the mouth. These teeth, not

being supported by adjoining teeth, will readily tip if not properly sustained. In fact, a molar tooth that is allowed to tip will offer but little more resistance to force than a bicuspid, but if sustained in an upright position, it will be impossible to force it bodily through the process with any ordinary power. This is especially true of the lower molars, which, when tipped to an anterior or posterior inclination, are readily forced from their embedment or partially lifted out of their sockets; but if held in an upright position, the two broad roots will resist immovably a large amount of force. When a single isolated molar is used for an anchorage attachment, the band should be wide and thick, fitted and cemented as carefully as a crown, with rigid attachments for inflexible extensions. However perfect the band and its attachments, if a flexible traction wire is used to transfer the power no obstruction is offered to the tipping tendency of the molar. The same is true with an inflexible power-rod, if the band is thin, narrow, and yielding, or in any way movable upon the tooth, or if the power-tube is short and loosely fitted to the rod.

DISCUSSION.

Dr. Jackson.—I have been very much interested in the paper. The doctor has been describing to us his way of teaching his method of anchorage, but he has not shown any specially new features. My system of anchorage is so entirely different that I think I shall let the gentlemen who have more general ideas of anchorage speak on the subject. I would not wedge the teeth apart to put two thicknesses of collar between them to gain an anchorage. That anchorage need not necessarily excite a congestion or inflammation that would work detrimentally, but I do not approve of the practice. There are several methods besides what I have described of gaining a perfect anchorage attached to molars. One that I have used for several years is making a cap over the molars and bicuspids, if they are not to be moved, and contouring it more accurately than a collar could be, because the grinding surface, being a little larger than the neck, it is very difficult to cement perfectly a collar on a tooth that is tapering towards the gum. Many make the mistake of not seeing that the collars are firmly cemented. In the system that I speak of, we would cement a piece of very thin metal, fortified by a thicker piece of metal, and then cement it firmly to the tooth. If the molar is not fully erupted, it can be made to assist in the anchorage by a thin, flat piece of metal soldered to the cap, and then cementing the whole firmly to the tooth.

That is probably one of the best methods we have of insuring an anchorage that will not permit the teeth to tip forward or backward. I appreciate the principle the doctor has intended to give us, from the scientific description of the use of the lever, which we should all understand thoroughly before attempting to regulate the teeth. I have but very little difficulty, in the method I practise, of the movement of the teeth detrimentally out of their natural position, when used for anchorage, because the first thing I do is to determine what influences are going to be exerted and to adopt methods that will prevent that movement. It is certainly irrational to believe that we can move several teeth any distance with a single tooth on either side of the arch as anchorage. We must fortify that anchorage. I get great benefit from the use of the plate, for instance, in contracting the anterior part of the arch, although Dr. Case has discarded the use of the plate entirely.

Dr. Noble, of Washington.—I have been intensely interested for years in the principles which have been enunciated so clearly and distinctly in the paper this morning. No one should undertake the correction of irregularities until those mechanical principles are thoroughly understood, and then he should study each and every case by careful impressions before undertaking to apply the principles. I am an enthusiastic admirer of what is known as the Jackson system. There has never been a time in my practice of over thirty years that I have not had cases of regulating going on, and therefore I speak somewhat from experience. I have come to the conclusion that the Jackson method will cover a larger number of cases with a greater simplicity than we have ever obtained before. I doubt very much if the general profession understand yet the simplicity of that system. If they did study and understand it as I have seen it illustrated in cases of my own within the past few years, I am sure they would use it. The principles are all correct. I say it without fear, and I believe that I can substantiate it with models that I have, that nearly all of these cases can be accomplished with a much more simple apparatus than those illustrated here to-day, however correct they may be. I indorse the principles that Dr. Case has given us, and I shall be very glad to show the models I have brought, and my way of accomplishing those ends, to any gentleman who wishes to see them.

Dr. McKellops.—This is a question that deserves a great deal of attention from my profession. Many men make a mistake when they undertake to do this thing, and that has ruined more mouths than we probably are aware of. I have met this gentleman at dif-

ferent meetings, and the results he accomplishes are wonderful, by understanding the anatomy of the jaws and the face. The profession ought to give this strict attention. We know the amount of crooked faces and jaws that come to us, and now under the experienced hands of such men a great deal of good can be accomplished.

Dr. Rich.—This paper is a very important one in the advance of this part of our profession. For the first time in any exhibition I have ever witnessed has a person endeavored to show us an apparatus for regulating the teeth in which the correct mechanical principles have been clearly stated and illustrated. The great fault of all the methods that have been presented for regulating teeth is that there has never accompanied them a correct exposition of the proper mechanical principles that should govern the construction of these apparatuses. Here is, for the first time in my experience, a system presented which is founded on correct mechanical principles which no one can deny, and it illustrates how they can be applied with the least amount of force to the portions of teeth that are to sustain the parts to be moved.

Dr. Ottolengui, of New York.—I rise with some reluctance to discuss this paper, because of the fact that this is my first year as a member of your Association. Ever since these theories were first advocated, and this exceedingly ingenious method of regulating was introduced, I have hoped for the opportunity of discussing this matter with the author of the apparatus present. I have preferred to do that rather than appear in print in opposition to some of the theories, because I recognize the fact that I may be entirely in error, and the exchange of erroneous views only encumbers the literature on the subject; whereas, if I express views now which the author can refute, the refutation will appear in print in the same article with my antagonism of the principle. In the first place, admitting the marvellous ingenuity, and giving the author due credit for the conception of his work, I do not conceive the general applicability of it which he claims. I think he said it was almost unlimited in its applicability. If by that he means it can be applied to a tremendous variety of cases, I concede that; but if he means to a tremendous variety of patients, I deny it. The use of abutments which are movable and which must be sustained in their position by the extreme ingenuity which the author has shown, is in itself an admission of weakness in the system. If we must depend on a lot of posts in the mud to move another post in the mud, that is a fundamental error. A common error which has been made

in the past in using this sort of anchorage, to which we are often driven, is that we have depended on the anterior anchorage. So far as I know, one of the earliest to publish a method to solve this problem was Dr. Jackson. By somewhat different principles the same result is obtained. Dr. Jackson often depends on the anterior teeth for anchorage, and also the molar teeth to move intermediate teeth. Whenever I have been called upon to get a third attachment,—to find a fixed portion in the anterior part of the mouth by placing a band in the mouth and uniting it with wire to the two posts in the back of the mouth,—the first difficulty that has met me is the sacrifice of the invaluable space that is occupied by the bands in the front of the mouth. This method depends upon many bands and the sacrifice of a great amount of space, all of which, if I were regulating the teeth, I would feel bound to close up. The author seems not to mind leaving spaces between the teeth, because he shows us a fixed appliance which is to retain his teeth.

Coming back to a further argument against the general applicability of this method, we find that the whole power of resistance to the movement which is to be made must come from the posterior teeth which are to support bands. Since this was promulgated I have had between twenty and thirty cases of protruded arches pass through my hands, and I have not found one case in which the posterior teeth offered a sufficient anchorage to the required power which would be needed to move the anterior teeth backward; that is why I am unwilling to wait until a child is grown up and all of its bones are hardened. I prefer to begin the retraction of a jaw as early as I find it,—the ninth year, if possible,—before the canines have appeared. I prefer to take the chance of taking the canines back with the unerupted processes, while the bones are soft, and I cannot do it with this method. In some of these illustrations we find that the anchorage has been sustained by both molars, which would indicate the fourteenth or fifteenth year, or an early development of the teeth in that arch. I must admit that there are exceptions that occur. A child is to come to me in the fall who is only eleven years of age, but whose twelfth-year molars are developed. The rarity of these cases, however, places them among the curiosities. I frequently find in these mouths very tiny lateral incisors and central incisors, teeth which are conical in shape, which does not allow you to use the band, so that the theory is not applicable as frequently in our hands as it seems to have been in the case of the children of the West.

I want to say a word about this other fixture. We have an

arrangement by which the solitary anchor-tooth is to be held. What will be the result if it is to be prevented from tipping? Without going into an extended examination of the fundamental physical principle involved, we have the molars fastened so that they cannot tip, and we have a force which is supposed to carry back eight or nine teeth on the strength of the buccal power of the teeth in the back, which has been further weakened by the removal of a tooth in front, leaving a boneless socket. Why should not those teeth go forward bodily? I say they will do so. The contour of the face is not affected by the moving of one tooth. By utilizing the anchorage of the posterior teeth for the resistance to our force, we are undermining and weakening the very thing upon which we most rely. I have seen teeth come to me with the retainer accurately fitting and the protrusion returning, and yet the dentists have said the teeth are all right because the retainer fits. So it does; but the necessity which says we must have a retainer recognizes the tendency of the front teeth to return; that force requires a fixed resistance, and if it is not great enough, they will move forward, retainer and all. Consequently, a method which is so old that we relegate it to the past, can be used, and that is utilizing the back of the head for anchorage and moving the teeth in that way.

Dr. Guilford.—I am one of those who have always admired the work of Dr. Case, and I am glad that we have in the field of orthodontia so able a workman. He has done much excellent and original work in this line, and we must give him credit for doing work which no one has done before him. If they have thought of it, they have not shown it. The movement by which he holds one portion of the tooth while he moves the other is beautifully shown. He has been the first one to do it, and he deserves our everlasting gratitude for it. To-day, while he has shown us the fundamental principles, I think he has made one or two errors. Dr. Ottolengui has anticipated me a little. In regard to the matter of levers, I do not think those are illustrations of levers at all. A lever must have a fulcrum somewhere, and those have not; they are simply illustrations of raising a weight. The other point I have spoken to Dr. Case about before. In a case like this, when you make an extension from a band upward and you apply your power either on the outside or the inside, you get your power where the base of the rod is. You gain something by having a wire to attach the bow wire, but that is all. I object to the claim that you get greater power; it is a convenience, nothing more. This bar would have as much effect as the one shown above.

Dr. Case showed us a wide band around the tooth; he seemed to feel that you would get an advantage by going beyond the gum. You get only so much as is attached to the band; going beyond it gives no advantage whatever.

In regard to some of the other points, we all recognize as an important matter the retaining and counteracting power applied in one direction by power applied in another direction. In regard to this matter of the posts, he explained to us why it was that in moving a post of that kind up to a certain point you had movement of the tissues nearest the surface. In the movement of a tooth of this kind, we must consider the outer layer of the bone, which is very dense. If we wanted to tip this root in the direction in which it has been tipped, we would want to take advantage of that layer. I do not doubt but what Dr. Case does that where he wants to move it back bodily, but he did not mention it.

Dr. Case lays great stress upon the fitting of the bands and burnishing them closer to the tooth. I believe in a band not occupying any more space than it should; but when you get one that adapts itself very closely to the tooth, you do not have much room for the cement, and it is the cement, as Dr. Jackson says, which holds the band there. I do not care to fit my bands so closely, but rather depend upon the cement to hold them in place. Dr. Ottolengui mentioned the putting of so many bands upon different teeth, which takes up the interdental space. If you want to move them inward, and you put so many bands on, you come to a point where these bands occupy space that you want. It is easy to do that in many cases. If I had a number of teeth that I wanted to move in, I would, instead of putting four bands, put only two.

In the matter of molars, if we have one band here and another one adjoining it (illustrating), it is a very difficult matter to press those teeth aside, so as to get room for your double bands; but a very simple way to do it is to get a little space, and making your band in the shape of a horseshoe, you only have one thickness instead of two. Dr. Jackson spoke of swedging a cap. That is a most excellent way in deciduous teeth; but in the permanent teeth often occlusion of the opposite teeth will prevent it, and therefore I prefer bands in the majority of cases. For the beauty of the appliance and the beautiful construction, as shown in the models, I have the greatest admiration for Dr. Case. He deserves all the credit we can give him for the work he has presented.

Dr. Case.—I met with about the usual reception that I expected somewhat, and I am quite surprised. I am not surprised at some

of the errors that Dr. Ottolengui made; but when Dr. Guilford says certain things that I would expect only from some of my students, I am exceedingly surprised. As I have but a little time, I would like to explain the simple little point of the relation of the two forces. Before I do so, permit me to say that I thank the gentlemen very much who have spoken favorably of me and my methods. My paper was brought here for the purpose of establishing, as far as possible, some fundamental principles relative to teaching students in the regulation of teeth. What have we been doing for the last fifteen years on that line? Why is it that this special department is far behind everything else? Simply because men have come before conventions of this kind with their models, showing how they succeeded in certain cases, and have brought the models to show the methods employed. I want to establish some foundation principle upon which this thing rests, that we may arrive at a more scientific and perfect position in this branch of orthodontia.

In regard to the method of applying these forces, the gentlemen say they do not see any difference between the two methods; that this bar extending above the gingival margin of the gum applies no different force, simply because it comes down and makes its attachment to the same place. One of the laws of force is that the impelling power is always in the direction of the force. If it is a rigid bar, it is impossible for many students to understand how that applies a force that is in direct line with the force on the root of that tooth. Suppose you are trying to move a tooth, the root of which is embedded in a mass of material. The resistance to that is between points along the posterior surface of the alveolus. If we can apply a force that is between the two points, we would carry the entire root in this direction in an upright position.

Dr. Rich.—Your theory is that that band must be rigid with the tooth itself?

Dr. Case.—Yes; and if that could be extended as high as the end of the root, if the bar is part of it and perfectly rigid, it is the same as applying the force to the end of the root.

Dr. Grant Molyneaux.—Dr. Case is wrong when he says it makes no difference how high you extend the bar. If you apply power to the lever directly at right angles to the power you are moving, it would bring the power a little higher on the root than if the power were directed straight across the gum margin. If this power is directed in this line, the power will be exerted parallel with it. If it is exerted directly across, it will intersect on the

other side of the body to be moved. If the bar extends the other way, the tooth will be drawn in the opposite way.

Dr. Case.—Suppose you have a small tooth, and you make a rigid bar and apply the force at this point, would it not tip that tooth over? If you make it rigid, you will find it is exactly equal to applying the force of the upright bar.

Subject passed.

The organization of sections then took place, after which the meeting adjourned.

(To be continued.)

AMERICAN ACADEMY OF DENTAL SCIENCE.

The regular monthly meeting of the American Academy of Dental Science was held at Young's Hotel, Boston, March 3, 1897, at six o'clock.

The paper for the evening was read by Gardner T. Swarts, M.D. Subject, "Diphtheria."

(For Dr. Swarts's paper, see page 705.)

DISCUSSION.

Chairman Cooke.—I am sure we have all enjoyed the interesting talk which our brother has given us, and the subject is now open for discussion by the members. If there are any points not fully understood by the members, I am sure Dr. Swarts will be pleased to answer any questions.

Dr. Werner.—I would like a repetition of the last part of his address, where he spoke of the disinfecting method that is in use now. I do not think I quite understood it.

Dr. Swarts.—Let us take, for instance, a tin,—any ordinary tin, such as a pan for setting out milk,—pack it with asbestos, and pour in some ordinary wood alcohol and ignite it, and the fumes coming up are caught by means of a circular tin which is made to fit over the base, and resembles somewhat a stove-pipe. About half-way up this circular tin let us insert a diaphragm of asbestos, which has little holes in it. That asbestos has been platinized, and is in such a condition that it can be brought up to a white heat without doing it any injury. Now, after that diaphragm has been heated, the alcohol flame is extinguished by placing a cover over the top of the circular tin for a moment; then the vapor of the alcohol in passing through the heated diaphragm becomes formaldehyde. It is wood

alcohol up to the heated diaphragm, beyond that it is formaldehyde gas. The value of this gas as a disinfectant has been known for some time, but it has not been possible for us to make practical use of the knowledge, on account of the great expense attending the manufacture of it, the cost of the solutions for its production previous to the perfection of this simple apparatus which I have explained being something like two to three dollars a pound. It is very effectual. You may place some of these diphtheria bacilli, or any other organisms, in any part of a room,—under the carpet, in the bed, in the closets, or anywhere you choose,—and when the formaldehyde is generated in that room it will be impossible to protect them from it. It will penetrate any kind of cloth, as well as the wall-paper, and even wood. In whatever part of the room the organisms may have lodged, it will find them and destroy them.

Dr. Werner.—Does it do any harm to the room or anything in it?

Dr. Swarts.—None whatever. It is a dry gas which apparently has no effect on any substance in the room.

Of course, the point we have been after most in this question of disinfection is the destruction of the tubercle bacillus. You know that the railroads carry a great many people West and South who are in different stages of consumption. The Pullman cars in which these patients ride are thoroughly cleaned every time they come in, say once a week, but, of course, it would be impracticable to use the ordinary method of fumigating. The method which is commonly used by them is to force a powerful blast of air through the upholstery and cushions, by which means the dust is freely blown out of the seats or the corners of the car in which it may have accumulated. They have to use very powerful air-pumps, and you will naturally see that the railroads have spent a great deal of money in trying to find something to kill these organisms without injury to the cars. When this method of producing formaldehyde was perfected, the investigators sent to the Pullman Car Company and asked them for every kind of cloth which was used in the manufacture of their cars. They sent on some two or three hundred different patterns and colors of cloth, silks, satins, brocades, and the various cloths which they used, and the formaldehyde had no effect whatever upon them, except in two instances, where it affected the colors. I think one was a shade of blue and the other a shade of brown. The fabrics were not injured in the least. This formaldehyde will produce an odor, but by placing a given quantity of ammonia in the room the air there will be almost as pure as ozone within an hour or two.

The introduction of this method of disinfection is certainly the beginning of the happy era for the inspector of the boards of health whose duty it is to fumigate houses after the recovery or removal of cases of diphtheria and other diseases. He used to be looked upon as the *béte noire* of every one he came to visit. Everything about the house was turned topsy-turvy, while many utensils and ornamental articles were completely ruined. We are not obliged now to take our clothing to the steam sterilizer, for the inspectors know when they have killed every germ in the room. For instance, in testing, their method is to take a piece of cloth and saturate it with a bouillon solution of a culture of some kind of bacteria. That is wrapped up in several thicknesses of cloth and placed between the mattresses of a bed; the inspector then goes through the usual process, and on his return he removes the package containing the bacteria culture, which is sent to the board of health, and a microscopical examination shows them to be dead.

Chairman Cooke.—How much expense and how much time does this process require in the case of the Pullman cars?

Dr. Swarts.—The expense would not be over sixty or seventy cents for a car, and the labor would be that of a porter. It should be allowed to continue for, say, ten hours, although we know we can destroy them in four to five hours, and if a car was obliged to start out again in that time it would be in good condition. It is the custom to shut it up over night, and there is then no doubt that it is absolutely sterile.

Dr. Bradley.—I would like to ask if, as this remedy has been shown to be so destructive to bacteria, some preparation of it could not be used in the treatment of the disease itself? If it will prevent the germination of the bacilli and destroy them, could it not be used in some form to help the patient to resist or overcome the disease, the same as the antitoxin?

Dr. Swarts.—I have thought a great deal on that subject, and several persons are still working upon it. The trouble we meet with is that the treatment necessary to kill bacteria is injurious to tissue.

Dr. Bradley.—Is a patient who has once been affected by the disease, diphtheria, more subject to it than another person? My own son, when he was three or four years old, had quite a severe attack, and after he was pronounced fully recovered he had another slight attack. I never understood whether the second attack was one of those purely accidental cases or whether the fact of his having had the disease before rendered him more subject to it.

Dr. Swarts.—It does not, so far as we know, except it may reduce the general constitution to a point from which the patient may never recover.

Dr. Bradley.—How long is the immunity of the average person after recovery from a case of diphtheria?

Dr. Swarts.—That is a question which cannot be satisfactorily answered. We cannot say, as in typhoid, that it may continue for life. It is generally believed to be six months to a year, though cases have been known where persons have contracted diphtheria within four months from the time of their recovery from a previous attack. So, you see, it does not come under the head of those diseases which the old ladies claim it is better to have and be over with. You know, when they used to hear of a case of measles or mumps, they used to say, "It's a good thing for the children to have; let's go and get it." It would not be wise for a person to deliberately contract diphtheria.

Chairman Cooke.—Take it in this patient that you spoke of who went from May to October. I do not think you stated whether the case was fatal.

Dr. Swarts.—Oh, no, the patient was immunized. The organisms could not overcome the antitoxin quality in her blood, and, at the same time, in this case the organisms refused to be expelled from her system. As far as she was concerned, they could do her no harm. She was perfectly free from the disease, and could have gone about wherever she chose, and thereby would have been a greater source of danger than a person who was seriously ill with the disease, but who was confined to one room with only a doctor and a nurse.

Dr. Clapp.—How long after the infection is antitoxin available?

Dr. Swarts.—Before the nervous system has become saturated with the toxin of the diphtheritic germ. It is wholly a matter of the strength of the patient's system to resist the effects of this toxin. If the disease is brought to our attention in its early stages and we introduce the antitoxin, then we assist the system in its efforts, and thereby go on to the extent of immunizing the patient.

Dr. Clapp.—Then there is always hope from the effect of this unless the patient is very much depleted?

Dr. Swarts.—Unless the toxin has become distributed through the system to such an extent that it is beyond the power of the system, aided by the antitoxin, to overcome it. The horses which are used for the manufacture of antitoxin will live for an indefinite period if they do not succumb to the toxin during the process of

immunization, a process which, as I have stated, extends sometimes over a period of eight months. They then proceed to draw from the horse, at the same time continuing the injection of the toxin, thereby keeping up the strength of the antitoxin quality of the blood to the standard as measured by its effect on guinea-pigs of certain weight. Some horses will not yield serum up to the standard strength, and when they find that a horse refuses to do so they sell him and get another horse. Occasionally they find one that is remarkable for the amount and quality of the serum produced. There is one old white horse in New York which produces great quantities of serum of excellent quality.

Chairman Cooke.—They milk them, same as you would a cow?

Dr. Swarts.—It has the same effect, but you get at it by a different process. The process is not a very painful one for the horses; they do not mind it.

Chairman Cooke.—Where are the most reliable preparations made?

Dr. Swarts.—Antitoxin is now made in several places in this country. Perhaps Mulford & Co., in Philadelphia, have paid the most attention to its manufacture. They are a druggist firm, and took up this question of antitoxin as soon as it came out, and are carrying on a perfectly clean business in every way. It is made for the city of Boston somewhere in the environs of Boston,—I do not remember now just where,—and by the State Board of Health of Massachusetts. The examinations of cultures sent in by physicians are made by the State, free of expense; the antitoxin is also given free to those patients who cannot afford it. At the office of the board of health we keep the antitoxin and syringes always on hand, and our instructions to physicians are, when they find a case of diphtheria, where the patient is too poor to buy what is necessary, to send at once to us and borrow the syringes and get a sufficient quantity of antitoxin, and use it quickly.

Chairman Cooke.—Any special method of cleaning those syringes after they have been used?

Dr. Swarts.—No; five per cent. carbolic acid will be sufficient. There would not be so much danger from the blood of the patient on the needle as from dirt which might be on the patient's skin.

I have brought down with me to-night a stained specimen of the Klebs-Löffler bacillus, which I will place in the microscope for your examination.

Dr. Eames.—I wish to express my appreciation of the manner in which the subject has been handled. I have been quite familiar

with these methods and know something of the work which has been done in Providence, Rhode Island, from a friend of mine in that city, and I can say truthfully that I have been pleased and agreeably surprised to find my attention held and my ideas thus stimulated. I think we all must now have a better understanding of this subject.

The mention of individual communion-cups interested me, for the idea was original with myself and resulted in the first use of them in New England. I believe that the discussion of this question will show that diseases may be transmitted from sources which formerly we had no idea were means of transmitting and propagating disease, and that the study of bacteriology will enlighten us still further in regard to this matter. I am surprised that men in the medical profession still avow that the common communion-cup is not a source of danger.

Another point which should be emphasized is the fact that there are two forms of stomatitis which may be confounded with diphtheria,—the aphthous form, also that form which is produced by means of parasites, stomatitis mycosa. In both of these we have a white patch, especially in the early stages of the aphthous form, and it should be pointed out that in aphthous stomatitis the white spots appear on the inner surfaces of the lips, on the gums, and on the edges of the tongue, while in diphtheria, as has been pointed out, the white patches are found on the tonsils and on the edges of the palate, extending from behind forward. The tough, leathery, diphtheritic patch is in contrast to the softer consistency of the aphthous patch, which is easily detachable. The sore throat and more profound systemic disturbances of diphtheria are not present in stomatitis, as a rule.

Dr. Werner.—I, for one, appreciate the scientific, concise, non-repeating talk of this evening, and I am very glad I came. It is a pleasure to listen to one who can talk directly to a subject. Dr. Swarts has that faculty to an extent which I have seldom heard in speakers. It is something we all ought to learn; we have certainly had a profitable lesson in the address to-night. The method of disinfecting with wood alcohol and asbestos is of value to know.

Dr. Eames and others have spoken of communion-cups. Just compare for a moment the number of people who go to communion with the number of school children who drink in common from dirty cups. We ought all to support in an effective way any movement to improve the conditions existing in our school-houses; we ought to attend meetings which give expression to the care of text-

books, drinking-cups, pencils, etc., for the school is a decidedly more important place to begin our reform than the church.

Dr. Potter.—I cannot help saying a word about what has been something of a hobby with me for a good many years. It is undoubtedly a wise thing to agitate this matter of communion-cups and common drinking-cups, but we must not overlook our own instruments and the apparatus we are constantly using. I do not wish to go into particulars, but simply to urge the importance of knowing that our instruments are sterilized by a reliable process after every use.

Dr. Swarts.—That point—that the instrument may be a means of infection—I did not see fit to dwell upon, as I supposed that you had heard a great deal about it. I am glad, however, that it has been brought up, as it is right in line with something that I did intend to speak of.

In the patients coming to you for dental operations, should you see a throat that is intensely inflamed, with little dots on the tonsils, or any extended inflammation of the mucous membrane, it would be policy to discontinue work on that patient, for two reasons: first, you are running the risk of contracting diphtheria through the patient coughing in your face or infecting yourself by the handling of the patient; in the second place, the patient should be at home and receiving medical treatment, not only for his own sake, but for the good of the public; and by advising him in this matter and notifying the board of health, with the consent of the patient, you will be doing both the patient and the health department a service. I say "with the consent of the patient," for if you do not obtain his consent you are likely to get into trouble, or, at least, forfeit his friendship. I, unfortunately, as a physician, was called into a house where there had been a death in the family from diphtheria to make examinations of the remaining members. I told the lady that if I was to act in the capacity of physician I should be obliged to follow the procedures prescribed by law. She insisted upon my being the physician, and though only one of the family was really clinically sick, yet examination of the cultures in that family of four showed the Klebs-Löffler bacillus present in two persons. I followed the legal requirements, and three hours afterwards was dishonorably discharged. As a physician, I reported to the health department the examinations made, accompanied by the cultures which I obtained; as a bacteriologist, I reported to the health department the discovery of the Klebs-Löffler bacillus. The superintendent of the city health depart-

ment ordered the patients quarantined and the house placarded in the usual manner. Another physician was called in, who declared that the patients were entirely free from diphtheria, and as a result there is now a five-thousand-dollar lawsuit hanging over my head for malpractice. So get the consent of the patient before you take any steps in a matter of this kind; but it would be a great help to the health department in this city, and in all cities, if cases of this kind were looked after at the earliest moment possible, because certain isolated cases might be the means of transmitting the disease to such an extent as to cause an epidemic.

Dr. Clapp.—To what extent is the quarantine carried?

Dr. Swarts.—Our practice in Providence is to quarantine the patient with one attendant, and, so far as practicable, to confine them to not more than two rooms. Of course, it is often difficult to do this, especially when your case is in a tenement house of, say, a half-dozen rooms, and there are seven children and three adults living there. We then insist that no children in that family shall attend school or Sunday-school, and that a watch be kept over them to prevent them from playing with other children. The father of the family is allowed to continue at work, and he also is instructed as to his relations with his family and with other people. The proper thing to do in a case of diphtheria would be the quarantining of every one in the house, if necessary, feeding the family at the public expense, and paying the bread-winner his customary wages, and I think that eventually this will be done. It is going to be expensive, but when compared with the cost of treating the cases it is more economical.

William H. Potter, D.M.D.,
Editor American Academy of Dental Science.

ODONTOLOGICAL SOCIETY OF PENNSYLVANIA.

The regular meeting of the Society was held March 13, 1897, the President, Dr. C. N. Peirce, in the chair.

Upon the completion of routine business, the President requested the essayist of the evening, Dr. N. V. Ball, to read his paper upon the subject, "The Mouth as the *Via Natura* for the Entrance of Disease."

(For Dr. Ball's paper, see page 724.)

DISCUSSION.

The President.—This interesting paper is before you for discussion. We shall be glad to hear from any member on the subject. Dr. Ball will be pleased to answer any questions that are suggested. I have been very much interested, indeed, in the paper, but I think that the doctor's lack of experience in dental operations has probably induced him to attach too much importance to wounds in the month as being open to infections for disease. When we consider the thousands of teeth that are extracted, the instances of serious results are rare. We do have some very serious conditions following extractions, but I think it is rather remarkable that they seldom occur, and this would indicate that the wound from the removal of a tooth was not a very serious matter.

While nearly every dentist applies some antiseptic at once, simply to satisfy the patient's mind,—and probably it is a good precaution, in a measure,—yet there are many teeth extracted where that is not done, and yet rarely do we have inflammation following the extraction. The instances where it occurs are in the removal of a third molar, between the second molar and the jaw, and where inflammation was present previous to the extraction. Indeed, I think that in every instance where inflammation follows extraction, it existed in the pericemental membrane previous to the extraction. Those instances do give the patients severe suffering.

Then regarding the effect of dentition upon the infant. The doctor explains a question that I was asked the other day when speaking to students about lancing the gum in cases of retarded eruption of the teeth. They said to me, "Are you not afraid of infection by lancing the gum?" I said I had never recognized it as a dangerous operation. Where we have what we call interrupted dentition, the source of trouble is from the resistance the gum offers to the advancement of the crown of the tooth, and that forces the tooth back into the uncalcified portion back of the pulp. And if the resistance offered by the gum is sufficient to prevent the advancement of the crown, it produces inflammation at the base and through the fifth pair, and wherever the filaments of those nerves may be distributed.

In regard to the allusions made to pneumonia during dentition. I have several families under my care, and in one family every child, previous to the eruption of the teeth, has been taken with severe catarrhal affections, bordering on pneumonia. I have lanced the gum freely, and the catarrhal affection subsided at once,

showing that the symptoms were from the irritation of the nerve caused by the crown pressing back on the uncalcified portion. That has occurred so often that I am satisfied that the tendency to catarrhal affection is induced by that irritation, and relieved just as soon as the pressure on the crowns of those teeth is removed, relieving the pressure at the base.

Lancing the gums is a favorite practice with me. I advise it in every case where the children are nervous. Never yet, of the dozens, if not hundreds, of children's mouths I have lanced, have I seen a single case of irritation following the lancing; but in almost every case I have seen a subsiding of the disturbance by the operation. So I am an advocate, a strong advocate, of the lance in eruption of the teeth. There have been children that recognized during eruption of their teeth the comfort the lance has given them, and they submitted to it with pleasure.

Notwithstanding I have made these little criticisms, I can readily see that there may be cases where we should be cautious and use antiseptic treatment where serious wounds have been made in the mouth, as in case of laceration of the pericemental membrane.

Dr. Head.—I was very much interested in this paper, and it brings up a great deal of material that will be of value to all dentists if they will apply it, not only in a general but special way, to their practice.

It is, as Dr. Peirce has said, a cause of wonder that wounds do heal so quickly in the mouth. But if they did not, it seems to me that it would be next to impossible for us to apply real antisepsis in that region, for while we might apply a mouth-wash once or twice, or every hour in the day, still the germs would grow and contamination would take place. And if there could be any way by which wounds in the mouth could be treated with the same antiseptic care that wounds are treated on the arm or leg, I think that all dentists would consider that a great boon had been given the dental profession.

Dr. Faught.—I have listened with a great deal of interest to this paper of Dr. Ball's. I stand, in the dental profession, for the maintenance of an antiseptic condition in the treatment of teeth.

I know that there is a disposition on the part of many to cavil at the possibility of infection, or at the needless expenditure of time and effort to overcome the thousand and one germs which are constantly getting the better of our efforts. But the citing of cases of patients that do not become infected, I do not think relieves us in

this age from applying the known means of combating germ troubles.

I am glad that Dr. Ball says the open wound is liable to very serious dangers. For the production of these troubles there are always three conditions—the germs, the lesions, and, still further, the pabulum—for these germs to grow and multiply upon. Now, where any one of these conditions is lacking, the infection is lacking. But we are so liable to have these conditions come together, and where we do have the trouble we have it just because the condition predisposes to the life of these germs. Therefore I believe we ought in all of our operations to be careful not only to instil into the minds of our patients the importance of this matter, but I believe that we ought also to use the utmost care of our instruments and everything we place in or about the mouth, and not carry the pathogenic germs from the mouth of one patient into that of another. That the probabilities in some cases are extremely strong there is no question, and we should use every effort to prevent the transfer of these germs.

I remember a gentleman presented on one occasion—I do not remember whether it was at a meeting or in private—a case of pyorrhœa alveolaris. He was speaking of the construction of an artificial denture, and told of a patient who persisted in the maintenance of a loose eye-tooth. He felt sure that if he could get that eye-tooth away, he could construct a denture. The patient persisted in refusing to part with that tooth. So, the story goes, he prepared an instrument from a case of pyorrhœa, and simply swept it around the neck of that tooth, with the result that the patient lost the tooth. The tooth extracted itself, as it appeared to her. That is perfectly possible, and shows that we should be extremely careful of the instruments.

Now, then, the great question arises as to whether the applications of antiseptics to an open wound are of no use, as Dr. Head says——

Dr. Head.—I did not say they are of no use. I said we could not apply them in the same manner as in other parts of the body.

Dr. Faught.—Well, the trend of your remarks——

Dr. Head.—I hope the President will restrain the gentleman from commenting on the "trend" of my remarks.

Dr. Faught.—Well, then, I will simply confine myself to the case in my mind, presented to my consideration to-day, in which some correction of irregularity had been performed.

The patient was a young girl, twenty-one years of age, or not more than twenty-five. In the construction of the appliance the operator carried into the mouth a band around the wisdom-tooth in some way. Concomitant with the insertion of that appliance, the patient applied to the operator, complaining of a serious ulcer, so she termed it, just at the posterior outer cusp of the wisdom tooth. The operator, supposing that, possibly, in the insertion of the appliance he had in some way pinched or wounded the tooth, looked upon it as unlikely to give further trouble.

At the end of three months *that ulcer is still there* and unhealed, and the gentleman has applied his applications to it in vain, and it still exists.

Now, whether it is some other infection that has produced that ulcer in the mouth, that would have occurred any way, I am not prepared to say. But the fact of its not healing, when it was apparently a simple ulcer, leads me to believe that, either owing to the impaired vitality of the patient, or the condition existing in her system at the present time, or a constant autoinfection going on there, that ulcer has not gone through the ordinary process of healing.

I was pleased to have Dr. Ball dwell upon that in his paper. So far as an application is concerned, I advise the application of strong tincture of iodine, to see if we could not bring back a healthy condition of tissue, placing the patient upon tincture of iron and some peptones—peptonoids—to build up the system at the same time in connection with it.

I would like to ask the doctor, too, if he would give some remarks regarding the possibility of infection from syphilitic troubles in the mouth,—as to which is the more troublesome, the primary or the secondary,—as to which condition would be an absolute debarrer, and as to which condition an operator might serve a patient. I would be very much interested in that portion of the possibilities. Because I think it is a question at the present day as to how far a person in practice has a right to take under his care a person in whom he recognizes a syphilitic condition. We do have those patients, and from good families. It is a question as to whether we ought to say to them, "We cannot do anything for you;" whether to debar them. How are we to meet the case?

Dr. Head.—I am sorry to have spoken so much this evening, but to make the "trend" of my remarks more clear, I wish to say that the only thing I had in mind was that in any ordinary surgical operation, if the knife is infected or not rendered thoroughly

antiseptic, no matter how carefully you may wash afterwards, the formation of pus will take place. It seemed to me hardly possible that any wound in the mouth could be treated so that infection would not be allowed to take place in the intervals of antiseptic washings.

The President.—Are there any further remarks from the Society?

We shall be glad to hear from Dr. Ball in explanation of the questions.

Dr. Ball.—In regard to syphilis: I did not take up those diseases that were not produced by germs. My remarks this evening had special relation to bacteria and such diseases as are of microbic origin, because that is the special subject in which I am interested and upon which I have been working.

Of course, it has been long recognized that syphilis was a common cause of infection. It is very contagious, especially the syphilis about the mouth, in mucous patches, which can be giving by kissing from one person to another. A person can be contaminated by kissing a person who has a mucous patch on the mouth. If, however, there are no lesions, the disease cannot be communicated in that way. As a rule, all those cases in which it has occurred have been where there has been some particular lesion about the mouth. One case I remember, which a woman contracted from her son by drinking out of the same cup.

Dentists may become infected by the fingers coming in contact with sores about the mouth, and should be very careful in their operations.

In regard to the particular ulceration mentioned, it is a difficult matter to say just what was the cause of that, or how to treat it, without seeing it. I should say that treatment by silver nitrate would have been beneficial.

It is astonishing that there are not more abscesses occurring from extraction of the teeth in practice. I can recall several instances of these arising from extraction. The dentists are not so apt to see these cases as the surgeon. I think that while they are not common, they are of sufficient frequency to require that some precaution be taken. Cuts about the fingers are not unusual, and often go untreated, and yet we know that these may become seriously affected. A surgeon making a cut about the finger treats it antiseptically, although he knows that thousands of people cut their fingers every day and do not treat it at all.

In my paper I should have read that a wound on the extraction

of a tooth should be treated as any other wound *in the mouth.* I read it as "any other wound." Of course, wounds in the mouth are difficult to keep clean, and yet if you are compelled to treat a wound there you do use precautions. Of such ordinary aseptic solutions as are given, probably the bichloride of mercury is most efficient.

The mouth can be washed out by rinsing after the use of food or at other times of the day. I think that while we cannot keep wounds in the mouth clean, as we cannot keep wounds of the bladder clean, or wounds about the rectum, or about any large cavities of the body which are exposed to the air and exposed to these infections, we can do the next best thing,—do the best we can.

We do not to-day recognize any catarrhal troubles as produced by irritation. We look upon all of them as produced by germs. Pneumonia is undoubtedly produced by a distinctive bacteria. Meningitis is produced by bacillus. I have practised largely among the children of the poor, and I find frequently that pneumonias happen during teething. Sometimes I think that probably the child is in a weakened condition at this time and more susceptible to disease. The more I look into it, the more I think that it is due to this local infection. I believe that the lancing may do good and relieve the irritation about the place. It may also relieve some local matter,—let out some of the local fluid that may be contained there. Of course, as a rule, there is no abscess, and we know that where there is no contagion the lancing often does a great deal of good. So in this case it may do good. We know that children do become infected from the milk, and have various disorders of the stomach from this source; why cannot infection occur through the inflamed condition of the gums? It is known now that the diarrhœal condition is produced by germs. The stomach is in an irritated condition from various causes, and then the germs normally present act rapidly. Diarrhœa is not produced by a specific bacillus of diarrhœa. It was formerly thought that there were certain bacteria that caused it; but to-day we know that many bacteria that are usually harmless do gain entrance into the body and so produce these diseases. And it is the same in the mouth. I do not know that I can say any more.

The President.—Are there any further remarks on this interesting subject?

Dr. Broomell.—Before the subject is passed, I would like to move that we extend a vote of thanks to Dr. Ball for his very interesting paper.

Motion carried.

The President.—The next business is incidents of practice.

Dr. Voight.—I would like to show the members a little novelty in the shape of a box for holding sand-paper disks. It is compact, and the disks are easily picked out. It is manufactured by the S. S. White Company.

JOSEPH HEAD, M.D., D.D.S.,
Editor Odontological Society of Pennsylvania.

Editorial.

THE REIGN OF LAW.

THE question of questions at the present time agitating college circles, as well as the dental profession, is that of law in connection with dental education. The existence of State Examining Boards has grown out largely of a jealousy of colleges in general and a selfish desire to prevent overcrowding in the ranks of both dental and medical workers. This is not the reason generally given. On the contrary, the idea is sought to be enforced that these boards are the result of an earnest desire upon the part of many men in the dental and medical professions to uplift college work and make it worthy the more exacting demands of the period. That this is the sole actuating motive of many worthy men cannot be denied; but admitting this, it still leaves an open door for that class to enter who antagonize and have always antagonized college work.

It has been one of the most discouraging features of educational labor on professional lines that those who know the least of this are the ones ever ready to rush into the arena of professional politics for a means to cripple the system, which the few earnest men have sought to build up and make more and more perfect during the passing years.

It is, therefore, with unusual gratification that one man has been found willing to enter the discussion of this subject with a broad conception of the entire matter, and it is hoped that the "Open Letter," by Dr. B. F. Arrington, on another page, will be read carefully by both sides interested in this important subject. It is a clear, logical statement of the questions involved from the

altruistic stand-point; and, in the opinion of the writer, meets the issue with a spirit worthy of imitation by those carping critics who assail college work apparently with no other object than the pleasure of antagonizing that which is above their comprehension and to them unattainable.

The examining boards, as at present constituted in the several States, were not organized without considerable opposition from legislative bodies and the public at large; but this gradually succumbed to the pressure until now they exist in all the States of the Union. In the majority they hold a supervising power over the colleges. These, while chartered to confer the right to practise, have had that power rendered a nullity and their diplomas relegated to a value equivalent to an ordinary certificate. There is as yet no method devised to prove the competency of the men who constitute the boards, nor is there any means provided to restrain them from rendering unjust decisions. They are practically a law unto themselves, with no supervising power to control their actions. They are placed in these positions mainly to re-examine graduates from colleges. This presumes that their training is in degree superior to that of those who have given their lives to the work of educating students. If the boards are not thus superior to the teachers in colleges, why are they given these positions of responsibility? Without reflecting on the qualifications of any set of men, it is manifestly unreasonable to suppose that dentists who have been long years in active practice, with no close connections with college work and with no time and little disposition for extended professional culture, should be gifted beyond those who have had opportunities for just the opposite training. It is unreasonable, nay, more, it is absurd, to place men, however good their motives may be, as regulators of the work of men their superiors in professional education. The manager of a large manufacturing establishment would not for a moment think of making a superintendent out of an unskilled artisan and have him judge the product. Yet this is exactly what our laws are doing. Dr. Arrington very forcibly puts this part of the question when he says, "I also honestly believe that dental college faculties, as a whole, are infinitely more competent and better prepared to judge of the qualifications requisite for successful practice and ultimate rendering of good service, to the honor and credit of the profession, than are the majority of dentists who compose dental examining boards."

The other side of this question is that relating to the students, and this Dr. Arrington seems very justly to regard as the most im-

portant. The action of some of the State boards in turning down these graduates by wholesale has roused an indignant response from the more intelligent of the dental profession. It is very clear that the college from which these young men graduated could not have been wilfully negligent of their duty, nor could the young men, after their years of study and work, have been incapable of practice in such numbers as have been reported. It is very evident that some State boards have overdone the work and have justly excited the suspicion that they were not as eager to improve the curriculum of colleges as they were to prevent additions to their number in practice. If the latter be the reason, and the evidence is very strong to support it, then the profession should demand the repeal of all laws that permit such a brutal interference with the efforts of young men to engage in an honorable calling.

Whether this has been the case or not, the power exists, and who is there to control it? The decision of these boards is final, and the graduates have no chance of appeal, and having none, they must sacrifice three years of time, labor, and oftentimes money earned through great privations, to the power of a few selfish men, for it is a waste of words to say that such action is based upon a desire to elevate the profession.

The range of subjects entering into the curriculum of dental colleges at the present time stands in no relation to that of a period of twenty years ago. The men who compose the boards of the several States, with scarcely any exception, are incapable of examining on the subjects as now taught. Chemistry, if taught at all, was through lectures and by experiments made by the incumbent of the chair. Bacteriology was an unknown study even five years ago. The study of anatomy was practically confined to the head. Physiology was a run over, as the young men were supposed to require but a superficial knowledge in this direction. Histology, general and special, was not taught in laboratories. If the dental student wished a knowledge of surgery, he had to acquire it outside of the dental college. Even in the supposed essential branches of prothesis and operative dentistry there have been radical advances, and to such an extent that the graduate of a few years back feels as he surveys the field like a door rusting on its hinges, and longs to renew college associations. Dental pathology and materia medica were taught a few years ago in a most perfunctory manner; now the relations to general pathology and therapeutics are made of vital importance. That some schools endeavored to fulfil all these requirements is acknowledged, but they were very excep-

tional and their work bore no relation to the present standard of requirements. If this statement be true, and all conversant with the facts know it to be true, how can these men undertake to traverse the knowledge gained by the students who have covered this entire work?

The result of all this is that young men are subjected, in many instances, to the examination of men ignorant, first of the proper methods of examination, and equally ignorant of the subjects they are supposed to examine upon and render a verdict for the good or ill of the poor victims of unreasonable law.

It is not to be understood that it is thought all law is undesirable. It is recognized that the statutes of the several States, however imperfectly formed, have had, in degree, a beneficial effect in stirring educators to a more healthful activity, and it would, perhaps, be unwise to repeal all laws upon dentistry and medicine, as has been suggested in certain quarters; but if the present laws were amended, so that no further re-examinations were permitted, and diplomas of one State were to be accepted in every State of the Union, and the suggestions of Dr. Arrington in regard to censors be added, it is thought we might move along for some years in a greater degree of harmony than exists at present.

One thing is very evident, that the National Association of Dental Examiners has passed the stage of tolerance, and if the State boards would cease to send delegates to it, one cause of a vast deal of trouble would be removed. As it stands to-day, it is a positive menace to the colleges of the country, and should be abated without any reservations as an obstruction to healthy dental progress. When it is remembered that this body has as part of its membership men not connected with any State boards, the absurdity of their pretending to control the work of the colleges becomes painfully apparent. When, also, one of these non-representative members is secretary of the Committee on Dental Colleges, the work of this body becomes absolutely farcical. The report of their proceedings would furnish most amusing reading were it not of serious moment to the parties most interested.

The time has arrived when this subject should be met with some decided action, for if colleges and students are to be the victims of an irresponsible national organization, these should know the worst, and the earlier this information is forthcoming the better it will be for all concerned.

There are, unfortunately, a few men of prominence as educators in dentistry, who sit supinely in our conventions, or openly defend

all law, however administered. The time is coming, if not already here, when this kind of spirit will not be tolerated. It bodes no good to a profession when ignorance and intolerance commands, and it is equally unfortunate when intelligence succumbs to this power and apologizes or supports it. Let the colleges of this country demand to be considered on this question of State boards, and in order to be heard, let them insist on being represented on every State board, and not, as now, completely excluded. It is an insult to every man connected with colleges to assume that they could not honestly examine students; but this is not surprising, in view of the fact that re-examination practically assumes that every professor is unworthy of confidence, and his decision, as to the standing of a student, not entitled to any consideration.

We have had time for discussion, and it has profited nothing. The time has come when the colleges of the United States must resist to the extreme, if necessary, these encroachments upon their just rights. It is due these educational institutions that at the next meeting of the National Association of Dental Faculties this subject should assume a very large share of attention, and it should be seriously considered whether some means should not be taken to prevent this growing interference with the legal rights of the schools.

Bibliography.

Loosening Teeth, or Chronic Alveolitis (Pyorrhœa Alveolaris, Phagedenic Pericementitis, Riggs's Disease, etc.). Its Causes, Clinical History, and Treatment. With General Directions for the Care of the Teeth. In two volumes. By Dr. Henry S. Nash, New York. Vol. I. New York: Barton F. Welles, 1897.

The author in this volume, upon what he denominates as "chronic alveolitis," has undertaken the serious task of explaining the origin of what is generally understood as pyorrhœa aveolaris. The first volume is now presented to dental readers, and, as stated, is "divided into five parts, for purposes of reference. The first of these will be historical; . . . the second comprises accounts of those of its types which do not concern the dental surgeon; and the third, those which are exclusively within his province.

"Following the notices of the different types of alveolitis, and introductory to the second volume, are some sections upon conditions which are prodromal and predisposing to the class of disorders in mind. These form the fourth and fifth parts."

In the first chapter, "Historical," the author details some of his early difficulties in the treatment of this disease, and freely consulted with Dr. Hamilton in regard to it; and it is interesting to note the following: "The question of its association with gout or rheumatism was one to which we devoted considerable time. I one day showed him some of the deposits called commonly, but, I think, inaccurately, serumal, when he told me to ask each person whose teeth showed its presence if either of these diseases had been experienced by him, or if there had been any history of them in his family. Careful and protracted inquiry demonstrated the fact that while there were cases where the tartar and one of these afflictions were concomitant, in the vast majority of instances they seemed to exist quite independently of each other."

The author, following the lead adopted by many writers upon this subject, seems to have worried over the name usually given the disease,—that of pyorrhœa alveolaris; and of this he "can hardly speak with patience." His efforts to secure a proper name carried him no further than "loosening teeth," although he, in part, adopts Dr. Hamilton's suggestion of "chronic alveolitis." This has the very great merit of simplicity, and would do very well if it were any better than the name heretofore given it and almost universally accepted.

The author seems to be possessed with the idea that this disease has its origin in the alveolar process; for, he says, "the alveolar process has a strong natural tendency to destructive change. . . . Any continued irritation of the gums, like that caused by the pressure of an ill-fitting clasp or plate, or that which they experience from the too vigorous use of a stiff tooth-brush, may occasion its recession." It would seem from this that he entertains the opinion that osteitis is a possibility independent of the periosteum. This, while recognized with some show of reason by writers, is, in the opinion of the reviewer, of doubtful possibility in the alveolar process. In any event, the periosteum and its analogue, the pericementum, and eventually the cement, are destroyed. To confine this disease to the alveolus is an impossibility: hence the name alveolitis is as much of a misnomer as that of pyorrhœa alveolaris. The proof is altogether the other way, for the beginnings of the pathological state are not with the alveolar process, neither with

the gingivæ, but with the pericementum, and extending from there to the periosteum.

The author gives this somewhat novel explanation of resorption of the temporary roots: "The roots of the deciduous teeth are removed by phagocytes." Upon what ground this assertion is based does not appear; but it would be interesting to know what gave rise to this new office of the white blood-corpuscle in addition to the many ascribed to it.

The idea of the author as to the origin of pyorrhœa alveolaris or, as he terms it, chronic alveolitis may be condensed in one sentence; for while he does not confine its beginnings to one source, this is regarded as the most important. He ventures, therefore, to call it "idiopathic," although he acknowledges that "no disease is such strictly speaking." And then, further on, says, "I will say briefly that idiopathic alveolitis is entirely of nervous origin."

He describes "the exciting causes of alveolitis" as follows: "A peculiar variety of hypercementosis, which is scarcely ever seen, except with elderly persons, specific disease, atrophy, and scurvy. These form its symptomatic division. Following these are three kinds of metallic poisoning,—lead, mercury, and bismuth. . . . Then there are two varieties which will be termed calcic, as both are induced by tartar; one will be called deep-seated, the other superficial. Next, one will be called eruptive. The eleventh is the most dangerous and mysterious of all. . . . I will . . . call it idiopathic alveolitis."

While the author shares the calcic idea with most writers, he very flatly classifies tartar, presumably salivary tartar, for he does not seem to recognize the serumal as a distinctive formation, or as the cause of alveolitis. It is passing strange that men so differ in observation of plain facts. The writer has never yet seen a case of pyorrhœa under accumulations of tartar, and, theoretically, it should not exist there. Recession of gums, destruction of pericementum and periosteum are necessary sequelæ of continued pressure, but no alveolitis, as he describes it.

The author is undoubtedly correct in objecting to the claim made that it is infectious, for this it certainly is not, whatever else it may be.

The disease is not considered by him as having a microbic origin, for he says, "I know of no reason why they should not become introduced afterwards, however; but, on the other hand, I see none why their agency is essential."

It is impossible to follow the author throughout this book of one

hundred and ninety-nine pages, and it must be said of this first volume that, while it is interesting, it does not illumine the subject, and it probably will fail to convince many that his conclusions are, in the main, correct. The story, as he understands it, of chronic alveolitis is told in an entertaining manner; but it would have been decidedly more effective if more condensed. The repetition of ideas adds no strength to the book; in fact, in a measure defeats a clear perception of the author's meaning.

Obituary.

REPORT OF THE COMMITTEE ON NECROLOGY OF THE NATIONAL ASSOCIATION OF DENTAL FACULTIES.

DR. FRANCIS PEABODY.

WHEREAS, Death has taken from among us Dr. Francis Peabody, of Louisville, Ky.; and

WHEREAS, We feel that in his death the profession has sustained the loss of an able practitioner and teacher; therefore be it

Resolved, That we tender to his bereaved family our heartfelt sympathy, and that we cause the resolutions to be entered upon the minutes of this Association; and be it further

Resolved, That a copy of these resolutions be sent to the dental journals for publication.

PROFESSOR FRANK ABBOTT.

WHEREAS, Death has removed from our ranks Professor Frank Abbott, of New York; and

WHEREAS, On account of his social qualities, his genial companionship, and his ability as a practitioner and teacher of dentistry, we realize the great loss to the profession in his death; therefore, be it

Resolved, That we tender to his family the sincere sympathy of this Association, and request that these resolutions be spread upon the minutes of the Association; and be it further

Resolved, That a copy of these resolutions be sent to the several dental journals of this country for publication.

RESOLUTIONS OF RESPECT TO DR. E. MAGITOT.

The Odontological Society of Chicago, recognizing the great services rendered by Magitot to the advancement of dental science, has adopted, and ordered sent to the family of the deceased and to the dental journals of the United States and France, the following:

Magitot was born in Paris in 1833, and died there during the current year. His first contribution to dental literature was made in 1857, at the age of twenty-four, relating to the structure and the development of the human teeth, while the last came from his pen in 1897, just before he died. During these forty years, Magitot wrote no less than sixty-five books, essays, pamphlets, etc., dealing exclusively with nearly every phase of dental embryology, histology, biology, pathology, hygiene, etc. No writer of any age has made as many, as varied, and as valuable contributions to dental science as Magitot.

The priceless services rendered by him entitle him to rank as one of the foremost investigators in odontology. He was a member of numerous scientific bodies and societies, whose members sincerely mourn his loss. It may be truly said that when Magitot passed away from the scenes of human activity, dental science, not of France alone, but of the entire world, lost one of its noblest and greatest minds.

The dental profession of the United States, recognizing and appreciating Magitot's services, keenly mourns and sympathizes with his bereaved family and the profession of France, by reason of his demise.

A. W. Harlan,
J. W. Wassau,
Louis Ottofy,
Committee.

Chicago, September 1, 1897.

THE

International Dental Journal.

Vol. XVIII. December, 1897. No. 12.

Original Communications.[1]

REGULATING WITHOUT EXTRACTION *VERSUS* EXTRACTION FOR REGULATING; SOME TYPICAL COMPARATIVE RESULTS.

BY WM. SLOCUM DAVENPORT, D.D S., PARIS, FRANCE.

(Concluded from page 631.)

Case IV.—Figs. 10, 12, and 14 represent the mouth of a girl fourteen years of age, whose four sixth-year molars had been extracted by her former dentist before the eruption of the twelfth-year molars. Figs. 11, 13, and 15 show the position of the teeth after treatment. When the twelfth-year molars erupted the forward and inner tipping was so great that the retaining power of the cusps was lost.

The lower jaw was forced to the left five millimetres, as is shown in Fig. 10, Line *A*.

Line *B*, Fig. 10, shows the faulty articulation of the teeth on the left side. The lower teeth articulate the width of a bicuspid too far backward, while the upper teeth of this side fall within the lower arch.

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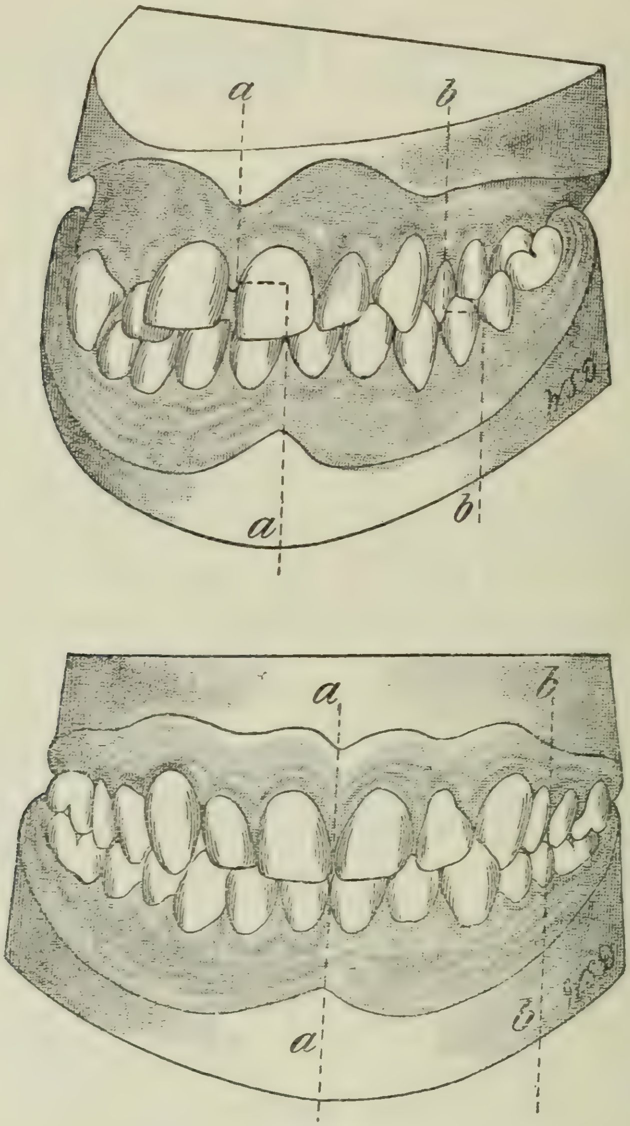
[1] The editor and publishers are not responsible for the views of authors of papers published in this department, nor for any claim to novelty, or otherwise, that may be made by them. No papers will be received for this department that have appeared in any other journal published in the country.

Line *A*, Fig. 11, shows the medium line in correct relation above and below after treatment. The articulation of the right side was comparatively perfect at first.

FIGS. 10 and 11.



Case IV.

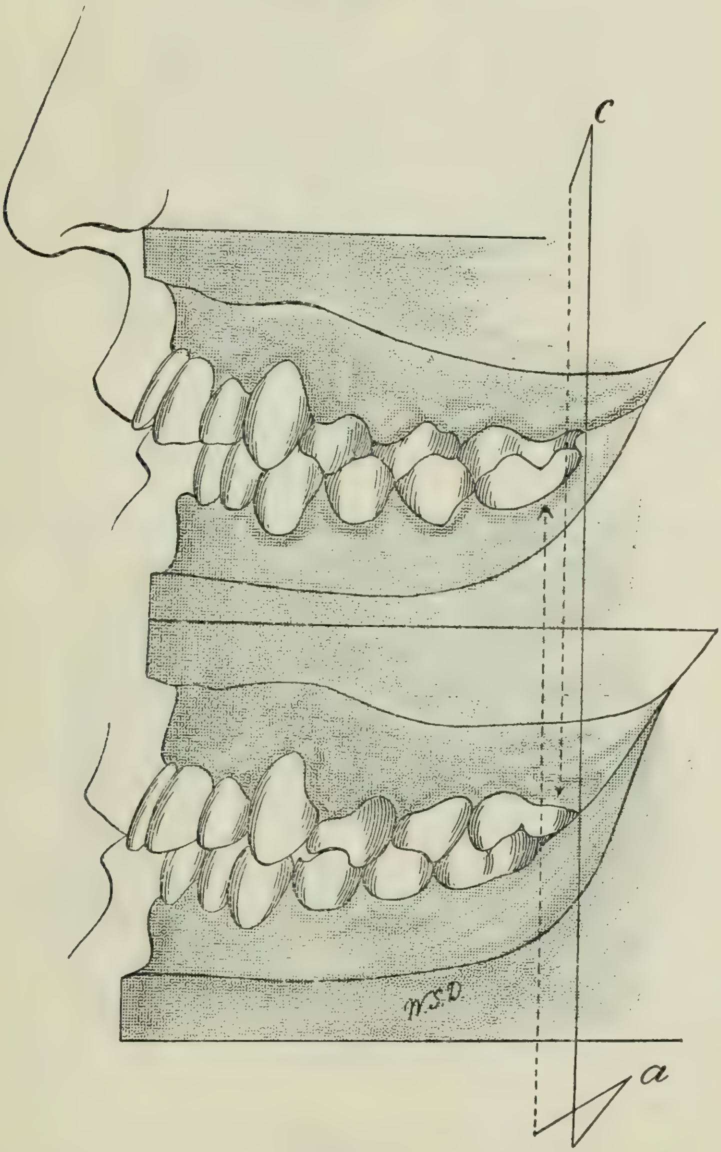
Fig. 16 illustrates the plate used to force the bicuspids and molars of the left side backward, and at the same time spread the arch. The plate was inserted with the springs in such a position that the force was brought to bear in the direction indicated by the dotted line.

Fig. 17 illustrates the plate used to continue the spreading of

the back teeth, including the canines. A similar plate was used to spread the lower arch in conformity with the upper.

A comparison of Line *A*, Figs. 10, 11, 12, and 13, shows the distance the lower arch moved forward and to the right, thus correcting the irregularity.

Figs. 12 and 13.



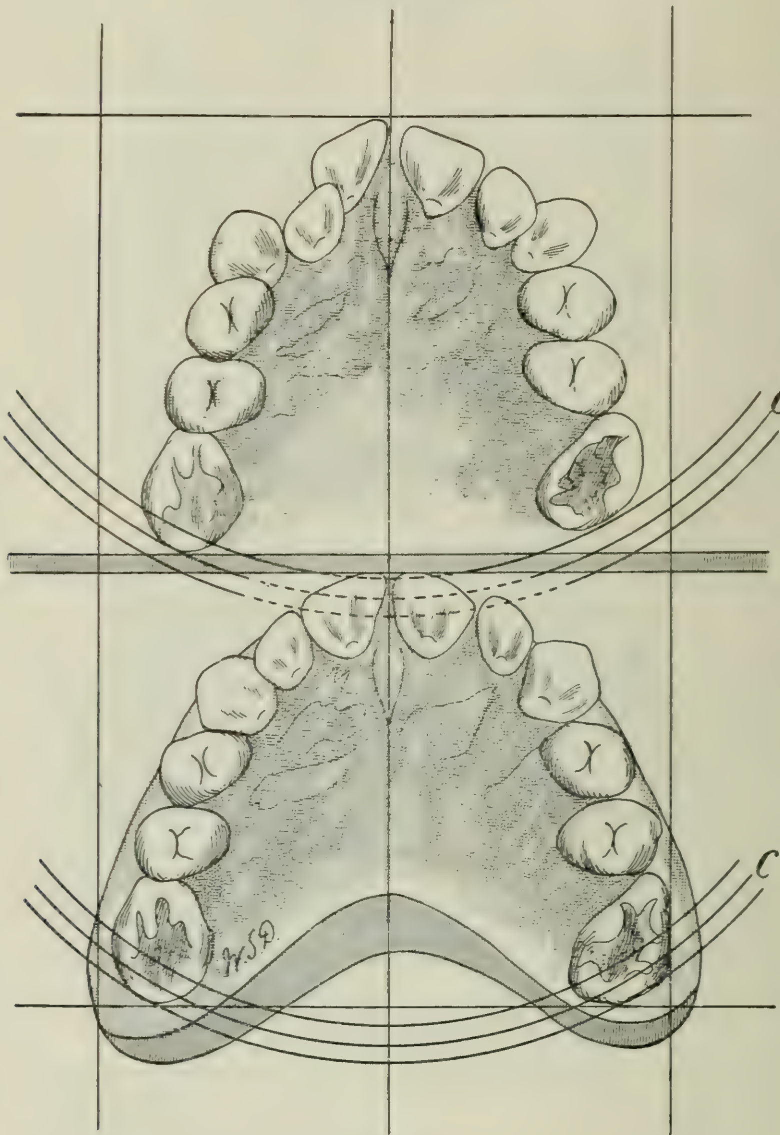
Case IV.

Line *C*, Figs. 12, 13, 14, and 15, shows how much the upper teeth on the left side were moved backward.

Comparison of Figs. 14 and 15 shows the changes which took place in the upper arch.

Case IV. is instructive in that it shows the bad position into which the teeth have fallen after extraction of the first molars. Further extraction, as is often advised to correct a similar acquired defect, would certainly, in the present case, have resulted dis-

Figs. 14 and 15.



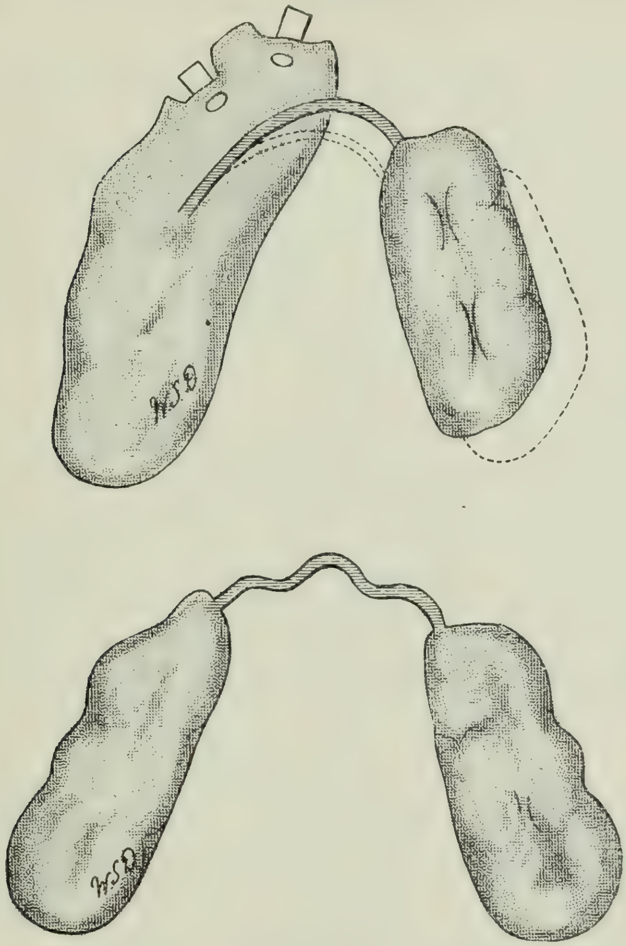
Case IV.

astrously. But by the plan of regulating without further extraction the normal relation of the arches to each other and to the true median line were restored; and the articulation also, as far as possible, with the first molars absent.

This seems to be a common form of acquired irregularity en-

tirely due to extraction of teeth, especially when practised (as is often done) with the idea of correcting what is considered to be an

Figs. 16 and 17.



Case IV.

overcrowded arch. I have yet to find an arch of this kind that could not be expanded to properly accommodate the teeth.

DR. G. V. BLACK'S CONCLUSIONS REVIEWED.[1]

BY CHARLES S. TOMES, F.R.S., LONDON, ENGLAND.

The experiments of Dr. Galippe, published in 1884, upon the specific gravities of different teeth, and those published in 1896 by Dr. Black, who appears to have overlooked those of the earlier experimenter, but who has extended his experiments to other

[1] Read before The New York Institute of Stomatology, October 5, 1897.

physical and chemical characters, are both, so far as they go, to be accepted as reliable in the absence of data to the contrary. It is useless to refuse to accept experimental facts, which are probably in the main correct, because they will not square with general impressions.

In the interest of scientific truth I have been compelled (*Journal British Dental Association*, 1895, *Transactions of the Odontological Society*, 1896, and fourth edition "Dental Surgery," 1897) to adversely criticise some of Dr. Black's work, but I wish at the outset to say that I value it very highly in its broad results, although I have a good deal to say in the way of criticism, and I by no means accept all the conclusions which he has drawn from his experiments.

Roughly speaking, I accept his integral figures; his second place of decimals I reject entirely, as being beyond the possible range of experimental accuracy, even had the methods employed been entirely satisfactory, which they were not; for similar reasons I distrust, though in a less degree, his first place of decimals. Hence all the inferences drawn from comparatively small figures I hold to be based upon data which have not been established.

It is impossible to enter at length here into my reasons for distrust, but, lest I seem to be speaking without warrant, I will briefly say why I hold the methods not to have been all that they might have been.

In the first place, Dr. Black weighed "wet" dentine. Now, "wetness" is a manifestly uncertain quantity, and chemists, while recording the amount of water that they can dry out by the prolonged employment of a temperature of 212° F., invariably base their calculated record of analyses on dry material.

In the next place, the dentine was incinerated in little blocks; now, the complete incineration of organic matter in bodies such as bone or dentine is not so easy that the complete combustion of the carbon is readily effected even when the fragments are so small that air has free access to a large part of their surfaces; in a block it is obviously even less exposed to oxygen than when in chips or turnings. Then the blocks were touched, and moved after partial incineration, another source of error in minute weighings; they should have been in platinum crucibles from the first to the last if the utmost attainable accuracy was sought. Hence there were sources of error in all the incineration experiments which, while they would not vitiate the rough results, still prevent us from building hypotheses upon small differences.

Another source of error, also vitiating the accuracy of close

weighings, was that no account was taken of the presence of carbonates in the dentine. When you incinerate salts among which carbonates are present you drive off some, but very rarely quite all, of the carbonic acid, thereby diminishing to an uncertain extent the weight of your residue, and therefore it is the rule for chemists to restore the lost carbonic acid before weighing an ash; this was apparently not done. Hence, surprised at Dr. Black's result that there was no difference between the proportion of lime salts present in good and in bad teeth, and seeing that the record of his experiments revealed sources of error, I undertook some check experiments myself, using every care and precaution known to me, with the result of not upsetting but confirming his principal contention, that the difference was not to be sought in the amount of the lime salts present.

For although my results differed a little from his, and in the direction of a slight deficiency in the salts in a set of poor teeth, yet, even if this was not an accident of the particular set, the difference was too small to have much effect. In the dentine of an elephant's tusk there is only fifty-seven per cent. of salts, while in the dentine of its molar there is seventy per cent., and yet the physical difference between the two is relatively slight.

But the inference that the difference as regards liability to caries lies outside the composition of the tooth is very far from being justified; it may be so, but a very much more searching investigation is called for before it is in the least established.

To begin with, to take the salts alone, they may be the same in total quantity and yet be very different in their proportions; a poor tooth may contain much more carbonate and less phosphate than a good one, or the reverse, and yet incineration experiments might not bring out any difference.

Again, we know very little for certain about the phosphate itself; it is not certain what phosphate it is, of the many which exist; and it is not certain if Hoppe Seyler's view be correct, that the hardening salt of bone and dentine and enamel is a double salt, a combination of one equivalent of carbonate with three equivalents of tribasic phosphate, analogous to the mineral apatite.

If Hoppe Seyler's bone salt is a reality, then a little proportional difference in the carbonate or phosphate present would result in the presence of one or other salt in the free condition, and, perhaps, therefore more easily attackable by a solvent.

Again, there is no wet method of preparing the tribasic phosphate anhydrous; it always contains one, two, or more equivalents

of water in combination, which cannot be dried out short of red heat; it is possible that different hydrates may exist in different teeth without a difference in the incinerated ash showing it.

As I have elsewhere pointed out (*Transactions of the Odontological Society*, 1896), the analyses of dentine as usually set out are entirely misleading, owing to their being based solely upon incinerations, and so setting down as organic matter all the combined water as well as the real organic matter. Thus, instead of setting down the composition of ivory (dried at 212° F.),—

> Lime salts, 57.5;
> Organic matter, 42.5 per cent.,

we ought to write,—

> Lime salts, 57.5;
> Organic matter, 34;
> Water in chemical combination, 8.5 per cent.

The quantities of free and combined water may be a source of difference of quality. It has not escaped Dr. Black that there may also be a chemical difference in the organic matter of the dentine; but there may be a chemical difference in the enamel also, although, according to Mr. Leon Williams, the explanation is not to be sought in the physical peculiarities of the enamel.

To sum up, while Dr. Black's researches have added a material set of facts to our knowledge, the inferences drawn from them are in excess of what they prove, and we cannot by any means safely say that the differences between good and bad teeth have no relation to their calcification; it may be so or it may not, so far as our safe data go.

All that we can say, and so far I fully go with him, is that between good and bad teeth there is not that difference in the total amount of salts that might have been expected, and that the difference in the total of salts, if there be one, is inadequate to produce well-marked effects in its physical characters.

For my own part, I still cherish the conviction that I can recognize by my eye a tooth of good quality and one of bad quality, and though I am compelled to abandon the vague idea which I once had that the bad tooth was deficient in its total salts,—Dr. Black has demonstrated that that notion is untenable,—I am not prepared to give up the idea that there is a physical or chemical difference until the subject has been thrashed out with far greater completeness than is the case at present.

Formerly we knew nothing, but imagined a great deal; now Dr. Galippe and Dr. Black have given us some scraps of positive knowledge to go upon; but it is only repeating our old error of forming hypotheses upon no data to form hypotheses which are far in excess of our data. And though it is not possible in brief compass to enter fully into abstruse matters such as these, yet I have perhaps said enough to justify my contention that, for all we as yet really know, there is plenty of room for physical and chemical differences between teeth of various qualities. Dr. Black has pricked one bubble, and for that I for one am very grateful to him, but inasmuch as his conclusions are somewhat at variance with clinical experience, I would utter a note of warning against the supposition that we so far know more than a very little as to the constitution of dentine and that we are in any position to make wide and general conclusions about it.

I have discussed one portion only of Dr. Black's papers and the chemical aspect of the question, but there is a great deal else of value in his research, and the profession is much indebted to him for a solid contribution to knowledge. If I have seemed to criticise unfavorably, that must be set down to the necessity of brevity and of dwelling rather upon points of disagreement than on those upon which we are in accord.

DR. G. V. BLACK'S CONCLUSIONS REVIEWED.[1]

BY DR. R. R. ANDREWS, BOSTON, MASS.

THE invitation to take part in the discussion of the views of Dr. Black I have accepted, but not without considerable hesitation.

These are problems for the profound thinker and the conscientious student. The views have been presented to us after a series of exact experiments, so minute, in fact, that it seems almost superfluous to question them. It is well-nigh impossible to exaggerate the value of this series of papers to the members of the dental profession, and I think I speak the professional opinion throughout this nation, as well as in Europe, when I say it is unanimous in regard to the value and the magnitude of Dr. Black's contributions to the science of dentistry.

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[1] Read before The New York Institute of Stomatology, October 5, 1897.

But the investigation, although great, cannot yet be considered complete. There is still *something wanting to make it harmonize with the experiences of our oldest and best-tried practitioners.* What thought I have given to the subject comes to me wholly from the mental impressions that are revealed not only to me, but to every thoughtful operator, as the result of many years of active practice. In this discussion, by your courtesy, I shall consider briefly the part played by the vital force through the organic matrix of the tooth. In this series of investigations on the physical character of the human teeth one gets the impression that there has hardly been given to the organic structure of the dentine and the cementum the great importance this tissue bears to the strength of the tooth and to its power to resist decay at the different periods in the life of the patient. The inorganic structure of the tooth may not have the strength in middle life that it has in youth, as has been shown by Dr. Black's experiments, but the vital power given to its organic structure by reason of robust health may be much greater, and as a result we find the organic structure fortified with this vital force, so that it will be found resisting the inroads of the destroying organisms to a very great degree. This is a phenomenon we cannot study with exact mechanical appliances. The teeth in health have a high power of resistance to decay. Who of us has not noticed the warty, discolored, and almost enamelless teeth that, strong but ugly, have resisted decay for years? And in some instances we have found decay to be completely stopped by the action of the organic structure fortified with a strong vitality. In youth, with lessened vital power, the tooth which Dr. Black's experiment shows to be stronger would, as a result, melt away. Every thoughtful operator has found that there are periods of decay, and we have all of us had experience with the results that come from overwork, fevers, or any troubles which tend to lessen this vital force. In fact, there is an abundance of testimony showing that premature or excessive intellectual work reacts upon the normal condition of the teeth, and scholastic success is often rewarded by impaired health and dental caries.

Some of us are familiar with a class of patients who have had magnificent sets of teeth up to the time of loss of health in middle life or old age. Then these almost perfect teeth commence rapidly to decay, and, with all our boasted skill, it is all but impossible to arrest the trouble.

In our younger patients a return to health after fevers often shows its beneficial result in the teeth. Impaired vitality at any

time, from whatever cause, has its marked effect upon the dentine; and in this condition it becomes more thoroughly a culture medium, in which the caries fungi thrive. On the other hand, exposed dentine, from wear or from fracture, will often end in decay when the patient is in vigorous health.

Most of us remember the experiments of Dr. Robert Arthur, of Baltimore, on cut and polished dentine; I quote several of his observations from his published work entitled "Prevention of Decay of Teeth," published in Philadelphia by Lippincott in 1871: "The dentine has a power to protect itself. When the surface of the dentine becomes exposed by the loss of enamel, it grows darker in color and may be taken for decay, but so far from being affected in this way, it is really no longer liable to decay except under very unfavorable circumstances. A tooth that has undergone such a change usually remains free from decay during life."

"The dentine is thus shown to resist vitally the influence of the decomposing forces. There is a vital property in dentine by means of which it is endowed with a certain power of self-protection,—the contents of the *exposed* canals seem to have become changed into a hard ivory-like substance, and it is probable that in the contents of the canals there is an interchange of lime for organic tissue, and the new formation differs from normal dentine by becoming denser and discolored."

Dr. Horace Hayden, in his practice in Baltimore from 1804 to 1843, frequently filed out cavities in the front teeth of young children, and Dr. Arthur assures us that after a lapse of sixty-four years the filed surfaces of some of these teeth, which came under his observation, were entirely free from any trace of decay.

Dr. W. H. H. Thackston is on record as saying, 1871, "I frequently meet with pearly, soft teeth, that I filed freely twenty to twenty-five years ago, sound and good, with texture hardened by time, and the change that occurs in all dental and osseous tissue as we advance in life with surfaces shining and lustrous, as if some natural polishing process had been going on in the mouth during the interval."

Dr. Black's experiments show that progressive hardening of the dentine does not occur. In closing, I wish to call your attention to some of his conclusions, printed in the *Dental Cosmos* for May, 1895, page 415, and here let me say that in many of these conclusions I heartily agree with him. Let us consider this one, the fifth: "There is no basis for the supposition that the teeth of children under the age of twelve years are too soft to receive me-

tallic fillings." In a sense I can agree with this; yet I believe it will have a very strong tendency to mislead. It is not merely a question of the softness of the tissue, but should be one rather of the health and vigor of the child and of our power as dental physicians to change the conditions which induce caries. Dr. Black has shown that the teeth of the young are by his tests the strongest, but in the opinion of nearly every operator whose judgment is of value it would in most cases be considered poor practice to insert gold fillings, however perfectly, at such an age. In my own practice I have for many years been a strong advocate of treatment of preparatory fillings made with the various cements. And twenty-five years' experience has shown me the solid value of this course.

It would be reasonable to expect failures in a majority of cases where teeth were filled with gold alone, and for the first time in the mouths of children under the twelfth year, even were it packed in the most perfect manner and by the finest operators.

I am wholly in accord with the seventh conclusion, where, in speaking of the hardness and strength of the teeth, he considers these qualities as dependent on the condition of the organic matrix. But I am at a loss to understand that part of the eighth conclusion where he says that differences in the strength (stated above as dependent upon the organic matrix) has no influence as to their liability to caries. This organic matrix, constituting the strength of the tooth, must, it seems to me, have a very strong influence as to its liability to decay, and I think this must be the conclusion at which we have all arrived. The organic matrix of the tooth is given a greater power to resist decay by constitutional factors during vigorous health. That it does not always succeed is not a proof of the absence of this vital force. This vital power is greatly lessened during almost all constitutional disturbances.

I am in accord with the statement, "That the cause of the difference in the liability of individuals to caries of the teeth is something in the constitution operating through the oral fluids and acting upon the active cause of caries, hindering or intensifying." But I would say more, I would have added, something in the constitution *operating through the organic structure of the dentine*, and also through the oral fluids, etc.

Decay, I believe, is in a measure dependent upon the condition of the organic structure of the tooth as well as on the condition of their environment. In proportion to the vitality of the part is its power to resist the action of external decomposing agents.

DR. G. V. BLACK'S CONCLUSIONS REVIEWED.[1]

BY DR. S. B. PALMER, SYRACUSE, N. Y.

My friend, Dr. Lord, recently made a request in your behalf, inviting me to give my conclusions upon the subjects which have been so ably discussed by Dr. Black, which I am informed are to be further discussed at your next meeting. I regret to offer my own opinions in opposition to one of authority and one so widely known and appreciated as a scientific investigator as Dr. Black. I have enjoyed Dr. Black's experiments, as given before the State Society, and more especially in his room at Albany, upon the subject of alloys and amalgams. Tests for shrinkage, edge strength, flow, etc., were made of numerous alloys, manipulated by different persons so accurately, and recorded by instruments so perfectly that all beholders were convinced and the results became knowledge to be utilized.

Dr. Black's investigations upon the physical characteristics of the teeth from a *physical* stand-point may be equally scientific, and I presume that others would record the same figures in repeating the experiments. Thus I will consume no time in an attempt to refute his tables. In a previous article the writer stated that his investigations were based upon the *organic* plane, consequently the teeth of children, or those which are not fully matured, are undergoing changes, consequently do not belong to the mineral kingdom to be classed with inert matter.

Time forbids taking up all the points mentioned in Dr. Black's conclusions. Perhaps the following are most derogatory to dental progress: "There is no basis for the selection and adaptation of filling-materials to soft teeth, hard teeth, frail teeth (in structure), or poorly calcified teeth. With our present knowledge, the only basis for selection and adaptation of filling-materials to classes of cases is the individual operator's judgment as to which he can so manipulate as to make the most perfect fillings, considering the circumstances, his own skill, and the durability of materials."

The above seems to indicate that operative dentistry has no scientific rules governing the proper adaptation of filling-materials to conditions of teeth. All is left to the operator's judgment. This may do for one who has had years of clinical experience, but to the young graduate from college, where such instructions have

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[1] Read before The New York Institute of Stomatology, October 5, 1897.

been received, it amounts to license to practise in accord with the highest ambition of a promising student, and to fill all teeth with gold, regardless of its adaptability, which would violate a natural law, and the penalty would be the loss of teeth and loss of patient, as well as reputation.

Before receiving your request, I had thought this subject passed. It seems that "in the fulness of time" an object lesson has been given by which I may be understood, and I feel grateful for the opportunity to lay the matter before you. We will now take our stand upon the animal plane where man "lives, moves, and has his being," which is quite above the plane upon which the conclusions under discussion were based. The order is this: First, elements; second, minerals; third, vegetable; fourth, animal.

"There is but one science of chemistry. Its divisions into *inorganic* and *organic* is simply one of convenience."

There is also one fundamental law known as chemism, or chemical affinity, which has passed from the elementary, where its prominent manifestations are union of elements up to the mineral plane, where it has a broader field for action, and more material to act upon, and we see as a result chemical compounds all composed and decomposed; in short, electrolysis is established, electric currents are generated, laboratory work is performed, and all that pertains to investigation upon inert matter is upon the physical plane.

Following the same law with its added possibilities up to the vegetable, we find more material for evolution. The breadth of life has touched chemical compounds and vegetation springs up from lichen to forest-trees. Follow the fundamental law. The physical current of the second plane, which was directed by the experiments in electrolyses, has been *organized* and is presided over by vital force or direction. The physical battery, with its positive and negative plates, is not needed. By the action of the light upon the foliage and the rootlets in contact with moist soil, through the medium of the sap, a to-and-fro current is established, minerals are decomposed, and plant-food is furnished for the growth of vegetation. With this principle most readers are familiar, and very little use is made of the lessons given.

And this is the end of helps, so far as organic chemistry relates to the teeth. The law is lost sight of, and the great mystery of animal *life* appears in physiology, which is beyond comprehension, and thus experiments are conducted upon the physical, where theories can be demonstrated with mathematical accuracy, and scientifically as well, as the tables of experiments will show. The

point I make is this: So far as the difference exists relating to the conditions of the teeth which we present, science, from the physical plane, is *misapplied*. Let us now follow the law with its aggregations to the animal, and see what material, what forces, and what director of forces we have to work with. Please pardon a seeming digression just here. I wish it understood that I do not attempt to meet the requirements demanded in an editorial in the January issue of *The Dental Practitioner*, 1896. The quotation shows one of the obstacles thrown in the way of this original writing, as well as to demonstrate that the investigations which we are called upon to refute are of the "earth earthy."

"Demonstrated facts cannot be successfully refuted by mere generalizations. They must be met by counter-facts as incontestably demonstrated by equally conclusive experiments. Physical proofs cannot be overthrown by metaphysical reasoning, and the world is waiting for some one to present a series of established tables that shall confute those of Dr. Black."

The above shows that the functions of the pulp in teeth have no influence upon the structure after twelve years of age. I quote the following:

"There is no basis for the supposition that some teeth are too soft or too poorly calcified to bear filling with gold or other metal in use for that purpose, since all are found to be abundantly strong."

"With our present knowledge the only basis for selection and adaptation of filling-materials is the operator's judgment as to which he can most perfectly manipulate."

There are facts recorded in the tables emanating from physical investigations so carefully prepared and systematically arranged that they are under the seal of science and challenge refutation. On the other hand, knowledge gained by clinical experience and correct observation becomes science as pure and true as that gained from experiments. Thus, since we cannot prove our position by presenting a series of established tables that shall refute those above quoted, we rest our case upon knowledge gained from clinical experience and systematic investigations upon the organic plane, and that it too bears the seal of science. This implies *knowledge*, and what do we know?

We know that teeth undergo changes from the time of their first calcareous deposit until the pulp, from natural limitation or from caries or accident, fails to perform its functions.

We know that teeth at twelve years of age have not reached the limit of pulp-nourishment.

We know that young teeth are softer than the same would be at maturity. Also that some are free from caries and others are badly decayed at the age of twelve or fourteen years.

We know that it is under a natural law that the latter decay when filled with gold without some insulating lining, for the following reasons: The fact that decay has attacked several teeth is evidence that the structure is faulty when the excavator fails to give the sound of cutting bone, the cuttings roll up as shavings, and we call the dentine soft. We know that the dentine is a conductor when in that condition. We realize that nature will not deposit lime salts against metal, and the approach to it is in proportion to the conductivity of the dentine. The line under fillings in normal dentine is hardly perceptible, and time produces no change detrimental to such fillings. On the other extreme, thermal changes prevent deposits or pulp-nourishment, and a thin lamina becomes devitalized, which is manifest in a year or more by a gray shade through the enamel; whereas, if gutta-percha or some non-irritating cement filling had been used the enamel would have remained clear.

I desire to fairly represent both phases or conditions of teeth, as we find them in general practice, notwithstanding the following quotation: "Caries of the teeth is not dependent upon any condition of the tissue of the teeth, but on conditions of their environment." We have endeavored to show that in young teeth pulps do have an influence upon sensitive dentine beneath metal fillings, and I will draw a line between dentine which is sensitive and that which is not, and pass the latter over to the physical plane where it properly belongs with inert matter. With experience in practice and from personal knowledge of metals in my own mouth, as given in previous papers, such a line must be drawn. The motive given for this laborious task seems to be for the abandonment of ideas and rules of practice which have been considered favorably in dental progress. Thus: "The greatest good that I could expect to come from this laborious investigation (except as it may affect the future study of the caries of the teeth) would be the general abandonment of the idea that the teeth of any patient are so lacking in density as to interfere with reasonable filling operations with any of the materials now in use."

I leave this last quotation without further comment, and close with a presentation of my views as to how the metals in the mouth affect sensitive dentine, pulps, and gums at the gingival border. For twenty years the labor has been almost in vain, so far as hav-

ing the principles understood. The practical introduction of cataphoresis has enlightened operators upon electric currents to a degree so that my contribution can be understood. The object to be obtained in cataphoresis is to carry drugs into tissue, dentine, pulps, etc., which offer more or less resistance. An electric current passing through liquids, or moist substances, carries with it from positive to negative water and the drugs which it holds in solution, —cocaine with other drugs, placed in a cavity to which is applied an electrode; this electrode is charged with a current of electricity from batteries or modified currents taken from a central station. The application and likeness this system has to metals worn in the mouth as fillings, clasps, bridges, and crowns, is this: The metals mentioned are electrodes *simply*, not connected by an outside supply, and would be lacking of a current but for the favorable conditions present in the oral cavity to generate galvanic currents directly in contact with the electrode. Very little has been written or said about the electro-chemical action produced in mastication of food. Nature seems to have introduced this principle for pleasure in eating. Frequently in a single meal are found numerous positive and negative elements which, if properly arranged in a physical battery cell, would produce measurable currents. Added to the physical apparatus, the *oral cavity* contains elements which have been raised from minerals to food, preserving the same laws of government with the elements organized. The cell is lined with vital membrane. The saliva is an unstable fluid readily changed from positive to negative. The carbon appears in an organized form in coffee, toast, and broiled meat, acids in fruits, and compounds of acids and alkalies, with hot and cold drinks, are masticated and mixed, causing the electro-chemical action mentioned. Every electrician understands that a negative metal plate like gold when emersed in such a mass becomes charged with electricity; that is, its potential is above the other pole which consists of the best conductor nearest to the electrode of highest potential. The application is this: When a gold filling is inserted into normal dentine the structure is practically a non-conductor to a current of such low tension, and even in dentine of less density no trouble may arise. We are using a figure of conveying medicaments through resisting mediums. This is by a physical current such as is used in ordinary electrical experiments; at the same time it illustrates a principle in organic currents that has been denied by opponents. This principle is known as osmosis. This is well defined by Dr. Jack: "If we arrange a vessel containing a saline mixture

on one side, and water on the other, with a permeable division between them, and apply the anode on the side of the salt and the cathode on the side of the water, the osmotic process is prevented. If, on the other hand, the anode is placed on the side of the water and the cathode in the salt, the osmotic action is greatly accelerated, and what otherwise would require hours to naturally effect is done immediately. This shows that electricity has the power to overcome or accelerate the natural law of osmosis." With these facts before us, and another still nearer the point, we wish to have it understood that we make the application. It is known that medicaments are carried with the current into lining tissue in the mouth. We know that the current seeks the best conductor or takes routes of least resistance, as a leak in the rubber and discharge into the gums gives evidence. In a recent article it was stated that twenty-five per cent. of gold-cap crowns and anchors of bridges produced an unhealthy condition where the metal came in contact with the gums. It was stated that it was not from impingement, as many suppose, but imperfection in the fit of the band, allowing accumulations, fermentation, etc. Even this does not afford a satisfactory answer. Knowledge which has been burned in, remains. Some years since I had a gold crown inserted over a molar which had become worn by a clasp after forty years support to a plate. The cap was straight or with parallel sides and a good fit. The gold extended slightly under the margin of the gums. No manifestation of impingement or irritation of the gums. The clasp was much like the crown except being split on one side and the cap or cover had a portion left open to give circulation so as not to confine food. In articulation with this below was a bridge of four crowns, coronal surfaces gold, which was a convincing proof of the theory advocated years before. I could fully realize that heat is convertible into electricity, for hot coffee more than any other hot drinks created a pain, not in the gum tissue, but in the dentine, to a degree that was exceedingly uncomfortable. Relief was obtained by the old standard remedy, *silver nitrate.*

Without the combinations and conditions to produce such results, and some knowledge of oral electricity, marked cases like the one described would have been passed by as having no foundation except in the imagination. The cause of the immediate sensitiveness was that the gold became charged by heat and the decomposition of saliva, which was as readily discharged into the gum tissue in contact with the dentine. Even this current differs but little from that generated out of the mouth, and the evil results are

on the line of a leak in the insulator, except in the wearing of the apparatus the current is applied wherever food is masticated. Instead of the generator being located outside and the current conducted through insulated wires, the electrode is placed in the cavity as a filling or spud for bridge support, or around the necks of teeth by gold crowns. These electrodes are charged directly by the chemical mass during mastication. Without experience in this line the above results might not have been known. With the experience of the writer it becomes scientific knowledge that no physical tabulated experiments can refute.

We have mentioned the aid which cataphoresis may afford us in understanding electric currents in the mouth. In all chemical changes, such as masticating food in connection with saliva, electricity is generated. It is of the nature of the elements from which it is produced; that is, food which has been organized, or, we may say, is animal electricity, some portion of which may be taken up by the tissue, but most goes into the stomach with the food, where, during the process of digestion, it is absorbed or goes into the circulation. It is well known that when a negative plate like platinum or gold is immersed in a compound like food with saliva the plate becomes charged with electricity of the physical kind. This is known by those who wear metal plates. A taste is known that would not be perceived but for the metal, and that metal one that would not be acted upon by any of the chemicals in the mass. This process is simply changing a current which nature produced from organized elements, with no other taste than the agreeable sensation experienced in the mingling of opposite elements—acid and alkalies, in soda-water, sweet and sour in lemonade, the carbon in coffee, broiled meats, toasts, etc.—with saliva and other food. Any combination in the mouth by which the vital current is changed to the physical is disagreeable and unnatural. Approximate fillings of gold and amalgam is sufficient proof of this statement.

Let us now look at nature's process of development of the teeth. They are covered by the gums until enamelled. Eruption takes place; the enamel serves as an environment during the growth and calcification of dentine and the roots. The skin covers the body in like manner as the gums cover the enamel, or as the bark environs the trunk of a tree, the growth is from within. Abrasion or removal of the skin is attended with inflammation. By injury or puncture of the enamel dentine becomes sensitive. Filling is like an adhesive plaster on the abraded skin: it excludes external exciting agents and nature heals the wound. If it were possible to

produce an elastic gold plaster for the skin, it would not answer without a non-conducting lining. The comparisons are parallel. The healing in the one case may be in a few weeks, in the other as many years according to development in the teeth.

Thus, a gold filling, large or small, which passes through enamel into dentine is an electrode charged, not by an outside system, but by the electricity in the mouth which gives it potential. It discharges according to the conductivity of the dentine. In normal dentine no discharge; in young teeth which are conductors, nature's process meets with an opposite current which in effect has been described above, showing that electricity has the power to overcome or accelerate the natural law of osmosis.

In comparing the effects of electric currents, the late Dr. Turner remarks, "Feeble agencies, operative for a long period, are often just as effective in affecting great changes as powerful agents at work during a short period."

There is no drug in connection with the gold filling, but an opposing counter-current, which overcomes natural law of osmosis, and in the cases and conditions of teeth favorable to such action the teeth receive no nourishment, and in effect animation is suspended.

Therefore, I believe in a scientific adaptation of filling-materials to conditions of the teeth.

DR. G. V. BLACK'S AND DR. J. LEON WILLIAMS'S CONCLUSIONS REVIEWED.[1]

BY JAMES TRUMAN, D.D.S.

The literature of dentistry has in the past two years been enriched by the investigations of two prominent workers, Drs. Black and Williams; for, however their conclusions may be criticised, there cannot be two opinions in regard to the value of their work. While this is conceded in the most generous terms, it is recognized that their deductions from their own labors are not satisfactory, and in some respects have had a very injurious effect upon minds who jump at conclusions on supposed authority, and these deductions are thus liable to become the prevailing thought of the dental profession. The statement that the work of these

[1] Read before The New York Institute of Stomatology, October 5, 1897.

industrious investigators is of great value seems hardly reconcilable with this view, but it must be remembered that original investigation leads to mental activity, and however erroneous the conclusions may appear to be, they induce to active thought and further work, and finally the truth is established. In this way all difficult problems have been solved, and it will continue, for generations to come, to be the open door for truth to enter.

Density, as generally understood, means "the mass or amount of matter per unit of bulk," or, as Newton gives it, "the property in bodies by which they contain a certain quantity of matter under a certain bulk or magnitude; closeness of contiguous parts; compactness." This is determined by specific gravity and by other tests. It has never been necessary for the practitioner of dentistry to be informed that some teeth represent a hardness equivalent to flint, and others are so soft that they are comparable to chalk, and have been thus named. According to Black, each of these presentations contain an equal amount of lime salts, or so nearly the same that the variation is not worth considering. In proof of this I quote Dr. Black's words (*Dental Cosmos*, May, 1893): "*These classifications, therefore, show conclusively that neither the density of the teeth nor the percentage of lime salts they contain has anything to do with the liability of the teeth to suffer from caries. In other words, the teeth of persons who suffer much from caries are just as hard, just as dense, just as heavy, and contain just as much lime salts as the teeth of persons who do not suffer from caries.*"

Now, this statement may be said to be true of teeth in general, but is very far from the truth when teeth are differentiated and examined in detail and in accordance with their apparent variations in density.

The difficulties surrounding an investigation of this character are practically insurmountable, for the simple reason that the material cannot be procured in sufficient quantity to make a test worthy of confidence. It counts for nothing if teeth be taken at random, and from this lot the decayed teeth be separated from the sound, and then the two lots be subjected to analysis after the Black method, with the result that each show equal quantities of lime salts. It would not require a very astute practitioner to decide this without investigation.

If, on the other hand, teeth had been selected from a mouth recognized as having chalky teeth, and these be compared with the aforementioned, and the result had been the same, it would not have been possible to have offered any criticisms, for even per-

sonal observations must give way to the crucible of analysis. Was this care exercised in Dr. Black's experiments? The answer to this may be expressed in his own language: "But a small number of the teeth used in this investigation have been extracted by myself. . . . In order to obtain material I arranged with certain gentlemen who extract many teeth to supply me. They were instructed to place the teeth in an envelope, just as they came from the mouth, write on the envelope the nativity, age, state of the general health, color of the hair, to class the teeth as bad, fair, or good, as to occurrence and rapidity of caries, record the condition of the gums, and mail the package to my address." Nothing in this, excepting "rapidity of caries," that would indicate that the extractor was to separate the so-called dense from the recognized chalky teeth. How any one extracting teeth indiscriminately could decide on rapidity of caries is a question not settled. Teeth are usually extracted because of continuous pain not amenable to treatment, or for the insertion of artificial teeth and treatment of irregularities. Caries is not confined to teeth of poor structure; indeed, it may be said, with some degree of truth, that this is no indication at all of the character or even the extent of the destruction, for all in long practice have met with very dense teeth melting down, as it were, under peculiar environments. It seems, therefore, amazing that so keen an observer as Dr. Black has proved himself to be should have based his whole work on such flimsy foundations, and makes this statement (p. 355) exceedingly fallacious: "The objects of the investigations here detailed, so far as they relate to the teeth, are to find the truth, if possible, as to the differences in the density, percentage of lime salts, strength, etc., occurring in the human teeth, and to find what relation, if any, such differences may bear to dental caries and other diseases of the teeth."

Then, again, we find him confining his investigations entirely to the dentine, for he says (p. 357), "I have chosen to confine the examination for density, proportion of water, lime salts, and organic matter to the dentine as best expressing the character of the tooth as a whole." While this may possibly have been the most convenient and best course to pursue, it leaves the coat of mail, the enamel, entirely out of the question, and this, the protective shield, is certainly an important factor in the inquiry.

Without extending the quotations from Dr. Black further, it may be said that if these deductions be accepted, then the observations in the practice of dentistry in the past decades must be valueless. It has been the observation from time immemorial that teeth

do decay in proportion to the so-called density of the tissue. It has been universally recognized that teeth of soft structure yield to environments with a rapidity that defies the best work of the skilful dentist, while, on the other hand, the teeth regarded as dense resist to a great extent the effect of surroundings and give way slowly to destructive influences, oftentimes resisting to the extent of causing a cessation of caries. The reason for this latter result can be explained only theoretically upon the fact that some teeth are more dense than others. This has been the accepted hypothesis, and Dr. Black's experiments have failed, for the reasons given, to dissipate or weaken the supposition. Until the same careful examination be made in selected teeth, as heretofore described, this theory must stand. It will, however, be an extremely difficult task to make such an investigation, as the material is not to be procured. The teeth which are denominated chalky are usually found in young persons, and to remove these for the sake of investigation is entirely out of the question, hence evidence as to their relative density cannot be forthcoming.

If Dr. Black's conclusions are to be accepted, then it is certain that other factors besides the amount of lime salts have an important bearing upon their resisting power. What these are has not been determined, and until this is known we can safely leave the question where it has remained in practice, that there is a vital difference in teeth, and that caries is largely dependent upon structure.

I have given but a cursory view of Dr. Black's work in the present article, for the reason that his series of papers, as far as they relate to this subject, have been subjected to my criticism elsewhere. The *résumé* given has, therefore, been mainly to revive the matter in connection with the work of Dr. Williams.

Dr. Williams in his paper, continued in *Dental Cosmos* from March to May, 1897, has given so much that is extremely valuable that I have hesitated to take up any portion of the subject-matter in a critical spirit. The only inducement to do this is to be found in the expectation that perhaps we can reach the truth better by a frank discussion than by the method usually adopted, that of giving laudatory opinions, permitting the setting to obscure the supposed value of the gem enclosed.

The principal object of the paper read before the New York Odontological Society, January 12, 1897, was apparently to supplement Miller and Black's work by showing the effect of environment in producing dental caries.

The author has, practically, divided his work into two parts, the first being devoted to the effect of environment upon pits, depressions, and fissures in the teeth of animals, and the same in the human subject. He has covered much ground in this investigation, and apparently omitted nothing to demonstrate the truth as he understood it, and has presented the dental profession with pictures unexcelled heretofore, and it must be conceded has proved that the difference in the destruction between man and the lower forms is placed principally upon environment. Was the great labor devoted to this necessary? The fact has been recognized for generations, nay, more, proved, that given entirely natural conditions as to air, food, water, and surroundings, teeth will not be affected materially, and it has been equally well known that man has for uncounted years entirely ignored all of nature's laws in respect to eating and drinking, and has suffered in tooth deterioration and destruction.

There seems to be a wide distinction to be made between the fissures upon the occlusal surfaces of molars and bicuspids in man and that of the porcupine, a section of whose tooth is so beautifully represented. It must be apparent to the most careless observer that the defects in the formation of the enamel in the human teeth hold no relation to the perfect enamel surface of those illustrated, and this may be said of all the depressions of the various forms of carnivora, rodentia, ungulata, ruminantia, etc. It has been recognized, and requires no proof, that removal from these natural conditions means a change of environment and destruction. This has been evidenced in the rapid destruction of teeth of whole droves of pigs, as well as other animals, fed on still slops. No one, therefore, who has made but a superficial study of the effect of environment will question the position of Dr. Williams and Dr. Black upon this point, and it has been recognized as an undisputed question for a lengthened period. It, therefore, cannot be considered as anything very new or very important.

The following quotation is a marked evidence of attempting to antagonize a well-recognized fact by negative testimony: "A considerable proportion of abnormalities in human teeth have always been attributed to certain exanthematous diseases peculiar to childhood, but I have never heard it suggested that infant gorillas or youthful chimpanzees were liable to attacks of measles, chicken-pox, or scarlet fever, and so the many imperfections which I have discovered in the enamel of their teeth came as a great surprise to me." Is there any evidence that "infant gorillas or youthful

chimpanzees" are not liable to diseases common to youthful humanity? The supposition would be equally as strong as his unsupported assertion that the exanthematous diseases may be, and of right ought to be, common with these forms, closely allied as they are to the human family. That these diseases do produce pits and other malformations in human teeth, through a disturbed nutrition, is as well proved as any problem in pathology, and nothing is gained by such assertions made under the guise of science.

The assertion is to my mind equally erroneous that, "Ask a dozen dentists, as you meet them, why human teeth are decaying so freely and rapidly to-day while the teeth of animals are not, and a majority of them will answer, Because the structure of human teeth is not so good as that found in the teeth of animals." This must be regarded as a pure creation of the imagination, as no one at all intelligent upon the subject would make such a statement.

Dr. Williams endorses very fully Dr. Black's work, and states that "notwithstanding the conclusions reached by Dr. Black, the opinion is still generally held by the dental profession that decay of the teeth is primarily due to degeneration which has taken place in the tissues of these organs." Degeneration does not seem to be the proper word to use, if it is intended to imply that a change takes place in the structure of the teeth during the lifetime of the individual. No one will, it is presumed, take this untenable position. If, however, is meant degeneration through successive generations, then the profession holds to the correct view. The possibility of a loss of vital power through changing environments and continued local systemic disturbances is properly recognized as prominent factors in deterioration. These are temporary disturbing elements to be corrected through time and improved conditions. The effect of climate, food, and deleterious surroundings produce changes well understood, and these may continue for generations, to be eventually succeeded by a gradual return to original types, for this seems to be an invariable law of nature; but this is not confined to the teeth, but applies with equal force to every organ of the body.

It is questionable whether this statement of Dr. Williams is absolutely correct, if his meaning be understood, that the opinion is generally held by the dental profession that decay of the teeth is primarily due to degeneration, but it is certainly true that many capable of truly measuring facts have decided otherwise. Talbot ("Etiology of Osseous Deformities") says that "certain monogenists have held that a human race could not effect a change of extreme

climate without the loss of life, while others maintained exactly opposite opinions. At any rate, we know that many races have passed these two extremes, but it causes an entire change in the structure of the offspring, both in man and beast as well as fruit and vegetables. Every race being a resultant whose components are partly the species itself, partly the sum of the modifying agencies, has produced deviations from the original stock." When, therefore, Dr. Williams repudiates the possibility of degeneration of teeth he sets aside facts as well established as the process of development of teeth.

In dismissing this part of Dr. Williams's work it must gratefully be acknowledged that he has given the dental world the most perfect illustrations, in discussing this subject, that have, probably, ever been seen, and these will remain as a perpetual evidence of the partial truth that decay is the product of environment, but they do not confirm this theory to the exclusion of that other, that structure is equally an important factor in destruction. In a word, it nowhere sustains Dr. Black's contention, if I am capable, through long and careful study of the paper, of understanding and appreciating his conclusions.

The portion of Dr. Williams's work devoted to antagonizing views held by Abbott, Heitzmann, and Bödecker, may be left as he places it, but it must be conceded that his demonstrations fall very far short of proving the correctness of his theory that sensation of enamel is not compatible with his demonstrations. His illustrations disproving the fibre theory of these microscopists may or may not be conclusive, but he does show that it is not difficult to make errors of observation through imperfect microscopical manipulation, a fact well understood by all workers in that direction.

The fact that sensation does exist in enamel cannot successfully be disputed. It, probably, has been recognized by every practitioner, and in exceptional cases is equal in intensity to that of dentine. Theoretically this should be existent, in moderate degree, for how otherwise would it be possible to understand the tactile sensibility of the enamel which Kölliker sought to explain by the action of the molecules of matter acting upon each other and eventually upon the pulp?

The definition which Williams gives to the term organic seems unsupported by evidence. An organ is understood as a "part of an organized body, which has some specific function." "The term organic as applied to any substance in no way relates to the pres-

ence or absence of life." On page 281, Fig. 45, is represented a "specimen of nearly decalcified enamel. . . . This specimen was mounted in glycerol, and pressure upon the cover glass showed that the portion outside of the line of striation moved slightly, but was held to the main mass by delicate fibres, which were not *between* the rods, but which *constituted the organic basis of the rods themselves.*" (Italics mine.) In thus stating, he concedes that there is an organic basis for enamel as well as of dentine. This means, in my opinion, possibilities not, seemingly, recognized by Williams. We are still left to conjecture as to the function of this organic matter, whether it constitutes a fixed proportion of the enamel, as the Heitzmann school held, or remained in very minute quantities, as Tomes sought to demonstrate. We know nothing as to the function of the sheaths of Neumann, but the fact that they are, practically, indestructible to acids proves that they are not inorganic, whatever else they may be, and the analogues to these in enamel may be, and probably are, part of the formative tissue, and suggest the possibility of these being the medium for the tactile sensibility of the teeth.

This point, while interesting as a subject for investigation, does not concern us at present. The main question to be considered, as I view it, is, Have we learned anything from Dr. Williams's exhibit in regard to caries? The answer must come to this from his own work. He evidently regards the results obtained as supplementary to that of Miller and Black, and that it, practically, completes the investigations into the origin of dental caries, in that it shows the beginning of dissolution of the enamel border, and eventual destruction of that tissue to which but slight attention has been given, either by the observers named or by those preceding them.

It is to the very great credit of Dr. Williams that he has taken up this difficult subject, for if all that he claims cannot be conceded, he has given actual demonstrations of the origin of decay in enamel in a way never before successfully attempted, owing to difficulties in technique heretofore supposed insurmountable.

While this is recognized, the deductions drawn from the illustrations cannot be accepted. When Dr. Williams asserts that the appearances indicate "*that decay was the result of some specific cause acting continuously at some particular point in a manner impossible to free acids in the mouth,*" he assumes a proposition that he does not prove. This is made stronger when further on he states, "*This mass of fungi is so dense and adhesive as to make it highly improbable that the enamel is affected, except in rare and special instances, by any*

acid other than that which is being excreted by the bacteria at the very point where they are attached to the enamel." It is possible that this supposition may be well grounded, but the author gives no evidence that enamel is destroyed through the acid excreted by the organisms, and such evidence has never been given with sufficient accuracy to make it worthy of acceptation. The mere fact that destruction is shown to have taken place beneath the fungi depicted has no force.

It may be well to consider what these forms really represent. They are originally known as leptothrix buccalis, the name given by Robin, 1847, and previously given various names, as Bühlmann's fibres, denticolæ, etc. Miller devotes considerable space to their consideration in his work on the "Micro-Organisms of the Human Mouth," and says, "As absolutely nothing was known concerning the biology and pathogenesis of this organism, all sorts of wonderful properties were ascribed to it." He divides these under several names,—"leptothrix innominata, bacillus buccalis maximus, and leptothrix buccalis maxima,"—but nowhere does he give these forms credit for the immediate destruction through the production of acid; in fact, has never been able to effect a pure culture out of the mouth. The assertion of Dr. Jung (Translation, INTERNATIONAL DENTAL JOURNAL, March, 1897), that "the leptothrix appears to play only a secondary part in caries according to present ideas," may be regarded as the most recent utterance from that authority, as Jung has been very close to Dr. Miller as his assistant. The theory of Leber and Rottenstein that leptothrix entered the tubulated structure after acid action is the nearest approach to the theory of Williams that I am familiar with, if we except Vignal, whose work with these organisms has not been corroborated.[1] The fact that these forms have been recognized as taking some part in caries is nothing new. It was taught fully a quarter of a century ago, but the *rationale* of the process was as much in the dark then as now, and the work of Miller finally placed a quietus upon the idea until its revival, upon insufficiant data, at the present time.

It is possible, indeed it is highly probable, that this mat of

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[1] Since this review was written, a paper has appeared in the October number of the *Journal of the British Dental Association*, by T. Choquet, D.E.D.P., Paris, on the Leptothrix Buccalis. He claims that this fungi is a "peculiar species," and thus endorses Vignal's work. He also confirms Miller's idea that several distinct forms of Leptothrix exist. Choquet was not able to demonstrate their pathological character. This interesting paper will be found under the head of Abstracts and Translations. J. T.

fungi has an effect, but not, as far as known, through the method suggested. The beautiful illustrations show clearly acid action, but is this necessarily the product of fungi?

The collection of so-called leptothrix in all slow-progressing caries forms a mat of considerable thickness over the dentine, and may be found on enamel and in other portions of the mouth. In a cavity, or externally, it unquestionably furnishes a retention place for the acids of fermentation, and as leptothrix seems to thrive best in an acid fluid, it holds the destructive agent in close juxtaposition to the dentine and enamel present, and dissolution of these rapidly supervenes. The same effect is produced and, in my opinion, in the same way by the introduction of cotton in a cavity. This will produce extreme hyperæsthesia in a few hours. Until Dr. Williams succeeds in proving that the fungi he shows in connection with enamel is acid-producing, his theory will fail to convince those at all familiar with the subject that this is the origin of caries through direct action.

Fermentation in the mouth cannot be set aside as a direct producer of destruction of the tissues of the teeth. This in no way invalidates the work of Miller, for no one has more thorough confidence in his conclusions than myself. The origin of caries, in its larger aspect, I regard as having been settled through his thorough and exhaustive work, but while conceding this I am not prepared to believe that his conclusions cover all the destruction witnessed in the oral cavity, nor would it be proper to dogmatically oppose these merely upon operations in practice or possibly crude microscopic examinations.

Some years ago I called attention to the fact that in investigating the origin of erosion I found that it was an error to confine the tests to the period when the alkaline saliva was most active in neutralizing the formative processes, but that it must be continued to periods when all the functions of the body were in comparative rest; in other words, at night. The result of my own observations and that of others, following my own line of work, confirmed the fact that fermentation was very active at this period. Tests in sufficient number of cases demonstrated that the fluids of the mouth gave neutral response during the day, and that so continually that this was decided to be the normal reaction during the period of greatest activity. The reaction at night was invariably acid. This led to the conclusion that all conditions of rest would produce a similar result, and this was proved to be correct by tests in cavities remote from the action of the saliva.

Accepting this as a demonstrated fact, what, then, may we conclude, that the acids produced by fermentation will destroy the enamel, as in erosion, without the direct action of micro-organisms? This, without disturbing accepted theories, simply points to other factors as taking part in the destruction of teeth.

Multiplication of words is not required to demonstrate to the intelligent practitioner that he constantly meets with teeth that are far below the average of normal structure. This soft, chalky condition is an existent quality, and no amount of investigation, after the methods of Black, will convince to the contrary. These are the teeth that are directly affected by what Black and Williams call the environments, and this is perhaps the correct term to use. The acid action upon this character of tooth-structure is too rapid to indicate micro-organic co-operation. It is direct chemical action, breaking down the inorganic elements and leaving the organic, or basis substance of the dentine, for this resists the disintegrating force for a longer period. Microscopic examination of portions of this tissue has shown that the organic base is destroyed more rapidly than the sheaths of Neumann, these being left prominently extending beyond the mass. This, from their indestructible nature, should be expected. Whether the protoplasmic fibre of Tomes remains intact in these sheaths cannot be demonstrated, but the great increase of sensitiveness in that class of teeth would indicate that they remain longer undisturbed than the inorganic portion and are subject to constant irritation through the presence of acids.

The conclusions I have reached from a study of the entire subject may be summed up as follows:

1. That Black succeeded in demonstrating that there was practically no difference in density in the teeth he subjected to examination and failed, in that he classed all teeth with caries as representing all variety of structure, and this being an error, his conclusions to that extent are weakened.

2. Dr. Williams in his attempt to demonstrate that there was no difference between human and animal teeth failed to consider of sufficient importance the unnatural conditions and changing environment not present in inferior forms.

3. It is not proved that micro-organisms have any direct surface influence on enamel, as Dr. Williams asserts that they have.

4. The cause of caries remains as Miller left it, if the subject be studied from comparatively dense teeth; but where the structure is below normal the factor of environment takes a pre-eminent po-

sition; in other words, direct chemical action supersedes, if it does not altogether take the place of, the intermediate action of micro-organisms.

If my conclusions be correct, the destruction of teeth can only be properly accounted for upon the facts established by Miller, combined with the older chemical theory of which Magitot was the leading exponent.

DR. G. V. BLACK'S CONCLUSIONS REVIEWED.[1]

BY GEORGE A. MAXFIELD, D.D.S., HOLYOKE, MASS.

In attempting to discuss the subject assigned for this evening, I want first to express my appreciation of Dr. Black's work as presented to us in the article in question. A brief examination of the tables given must convince one of the immense amount of labor involved and the scientific accuracy with which the work was carried on. The facts presented appeared to shatter the whole foundation on which we had built. What we have considered and taught as scientific facts, according to Dr. Black, are simply traditions and erroneous fallacies. We cannot question these facts. They are scientific truths.

We can no longer seek to find coarse and unpalatable foods with the expectation of increasing the amount of the lime salts in the teeth. The vast amount of literature on this subject, to which many of us have added, advocating that of which we knew nothing, because we simply accepted the "traditions of the Fathers," must now be cast into the flames. Would that the fallacies they have created could as easily be destroyed and our minds be left free to discuss Dr. Black's conclusions without bias and with a full understanding of the facts he has presented. Personally, I fully agree with many of Dr. Black's conclusions, while the ones proposed for this discussion are at direct variance with my clinical experience.

On page 354, almost at the beginning of his paper, he says, "Two well-known facts have seemed to argue against the interpretation that the clinical appearances mean soft or softening teeth. First, the teeth are the hardest structures of the body, and are of the lowest vital endowment as to self-repair, and are therefore the

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[1] Read before The New York Institute of Stomatology, October 5, 1897.

slowest in vital changes. Second, caries, according to present accepted theories, attacks the teeth from without, acts upon the teeth, beginning upon the outside, and *presumably the physical or vital condition of the teeth themselves* has little to do in the case. Both of these propositions, if admitted, seem to argue that this melting down of the teeth is dependent on some factor or factors outside of and practically independent of the physical or vital conditions of the tissues of the tooth." (Italics mine.)

After a careful study of Dr. Black's paper, with the light of my clinical experience, I cannot admit this proposition. It is on this presumption that Dr. Black based his conclusion, that "caries of the teeth is not dependent upon any condition of the tissues of the teeth, but on conditions of their environment."

With the knowledge of Dr. Black's long clinical experience and the results obtained by his studies of the "Physical Characteristics of the Human Teeth," it is surprising that he should announce this as a logical conclusion. To my mind the study of this paper gives convincing proof that the physical or vital conditions of the tissues of the teeth are an important factor of caries, and to support this claim I present several quotations.

On page 416 we find the following: "The logical inference is that the cause of the differences in the liability of individuals to caries of the teeth is something in the constitution operating through the oral fluids, and acting upon the active cause of caries, hindering or intensifying its effect." The first question to consider is, do the oral fluids contain a principle or substance which by its presence renders the teeth immune from caries or exerts deterrent action upon the caries-producing organisms? On page 418 he advances the following in support of this theory: "This hypothesis is further supported by the well-confirmed observation that the opening of a carious cavity by accident or intentionally by breakage of overhanging walls has a marked deterrent effect upon the rate of progress of the carious process." Immediately following he answers this by saying, "This again may in some degree be explained by the simple absorption of these products by the flow of saliva." To obviate this latter objection to his theory he says, "But this kind of dissipation of the products would be measurably the same for different individuals, while the observation is that the effect of the dissipation is greatly different in different individuals." If instead of this latter he had said, This kind of dissipation of the products would be measurably the same in the different cavities in the same mouth,—which is a fact well known to all careful

observers,—it would have been as applicable to one side of the argument as the other. Again, on page 417, "It seems to be admitted by all who have examined the subject from the stand-point of the bacteriologist that the caries-producing organisms are present in every mouth, whether caries occurs or not. I have myself made cultures from the saliva of many people, those in whose teeth caries was making sad havoc and those in whose teeth no caries whatever appeared, and must say that I have found no mouth that was free from the caries-producing organisms." If the oral fluids contain this "deterrent principle or substance," how is it these caries-producing organisms flourish in every human mouth, regardless of any carious process in the teeth?

Accepting the theory which has been so ably demonstrated by Drs. Williams, Black, Andrews, Miller, and many others, that caries of the teeth is the result of the action of micro-organisms, let us consider whether there can be any change in the teeth that may render them at times less liable to the ravages of these organisms. Are there any differences in the structure of the teeth of different individuals, or in the various teeth of the same individual? Do physiological changes occur in the teeth? Let us read Dr. Black's views.

On page 391, referring to the specific gravity: "But there is a difference between the individual teeth of the same person that is much greater than the difference in averages of the teeth of different persons. Take the first number in the general table, No. 142,—sixteen teeth from one person. The upper right central incisor has a specific gravity of 2.085, while the left, standing beside it, and apparently under exactly similar conditions of development and nutrition, has a specific gravity of 2.103, a difference of eighteen-thousandths of a volume." The wide variation in this individual amounted to sixty-five-thousandths of a volume. Reference to the table show the per cent. of lime salts of the upper right second molar to be 65.12, and the adjoining third molar to be 62.73, a difference of 2.39 per cent.

On page 393: "From the study of these exhibits it is found that there is practically a continuous increase in the density of the teeth, and in the percentage of lime salts they contain, from youth to old age. . . . Beginning with 62.26 per cent. for the average age of eleven years, it increases to an average of 64.56 per cent. for the average age of sixty-three years. This is an increase of 2.3 per cent. This result confirms the hypothesis arrived at from clinical observation, namely, that the density of the teeth increases from

childhood to adult age. But it does more. It shows the increase continues practically during life, and that in this respect the teeth are similar to the bones." Again, on page 414, referring to pulpless teeth, "The parting of enamel from the dentine seems to be peculiar to pulpless teeth and to those in which the pulp has been long calcified so as to cut off the *nutrition of the dentine.*"

The above shows that Dr. Black believes that the vital action is not confined to the pulp, but extends throughout the whole tooth.

On page 392 he says, "After the work I have done with the teeth I have come to regard the organic matrix of the tooth as much more important than I had formerly considered it. The condition of the organic matter seems to have much to do with the strength of the teeth, and is a matter that needs further investigation."

Clinical observation demonstrates to us that there are changes occurring in the teeth, a continual retrogression, at times rapid, while at other times there is a decided reaction, and the tooth recovers its normal tone. From Dr. Black's demonstrations we learn that these changes must be in the organic structure of the teeth and not in the amount of the lime salts. There are differences in teeth, and we cannot express these differences in better terms than we have always used, "hard teeth," "dense teeth," "frail teeth," "soft teeth," "chalky teeth." As this difference must be wholly in the organic matrix of the tooth, therefore the logical inference is they are the result of vital influences. The liability of caries is much greater in those teeth classed as soft than those classed as hard. Clinical observation also demonstrates that pulpless teeth are less liable to caries than teeth in the same mouth containing living pulps, and when caries begins the progress is much slower.

As to the environment, I quote from page 418, where he refers to the artificial production of caries outside of the mouth: "This observation I have myself verified, and the difference in the rapidity of the progress thus produced artificially in the test-tubes and that occurring under what may be called natural conditions within the human mouth contrasted. I have never seen caries in the mouth progress with such rapidity under any conditions whatever, either in teeth with living or dead pulps. Perhaps some difference may be explained by the absorption and removal of the acid formed by the micro-organisms through the continuous flow of the oral fluids, thus preventing the same degree of concentration of the acid products. But at best this can be but a very partial explanation of the phenomena observed, and is no explanation whatever of the

differences in the susceptibility of the teeth of different individuals. It is known that micro-organisms do not grow so well in the concentration of the lactic acid which occurs in our culture-tubes, and that if this is allowed too great a concentration their growth ceases entirely. Yet they will penetrate dentine farther in the same length of time in the tubes than they will in the mouth.

"If this proposition is correct, we must conclude that there is some deterrent force operating within the human mouth that is not present in the test-tubes, a force of some kind, or of some nature, that acts to hinder the destructive effects of the products of the micro-organisms, either by restraining the growth of the organisms by hindering the production of their typical acid excretions, or by limiting the effects of the acid excreted by the organisms. Such an effect seems not to be produced by any condition of the teeth themselves connected with their vitality, since the observation applies with *equal force to pulpless or dead dentine* as to *living dentine.* Then this power, or deterrent force, is extraneous to the teeth; its action is from without."

This is the strongest argument advanced by Dr. Black in support of his conclusion. In the culture-tubes there can be no difference between pulpless teeth and those in which there were living pulps. *In either case, can it be other than dead dentine?*

When we consider this, together with the question already raised as to the possibility of the oral fluids containing the deterrent principle or substance, and the caries-producing organisms at the same time, I hardly think the argument is sustained.

From these studies we arrive at the following logical conclusions, namely, that the physiological and pathological changes which occur in the organic structure of the teeth are an important factor in the progress of caries.

I would not belittle the work of Dr. Black one iota, for I sincerely believe that as he continues his investigations he will discover facts verifying our clinical observations, and other facts which will enable us by natural physiological processes to produce changes in the organic structure of the teeth, whereby they will be able to repel the caries-producing organisms.

DR. G. V. BLACK'S CONCLUSIONS REVIEWED.[1]

BY DR. E. A. BOGUE, NEW YORK.

In answer to your request for a communication that discusses the subject of Dr. Black's recent papers, I experience the same difficulty that I presume Dr. Black encountered at the beginning of his efforts to record the results of his experiments,—namely, the difficulty of pronouncing one's self.

I conceive that the more we discuss and work upon the facts which he has given, the clearer will become our concept of the truth as he meant to pronounce it.

To state only that "caries of the teeth is not dependent upon any condition of the tissues of the teeth, but on conditions of their environment," would seem to be stating something quite different from the statement in the *Digest:* "That the structure of the teeth is not a factor in their liability to caries *further than that pits, grooves, fissures,* and *roughness of surfaces* give opportunity by inviting lodgement and facilitating the growth of micro-organisms at particular points." So far as I am able to understand, the *condition* of the tissues of the teeth is involved in roughness or smoothness, in roundness or flatness, in density (specific gravity) or looseness of texture.

All these are conditions as well as the forms of the teeth.

In the *Dental Cosmos* for April, 1896, page 298, Dr. Black says that his work upon the teeth did not include variations in the hardness of the teeth to cutting instruments. This is a very important exception, and in view of it I am quite ready to concede all the rest of Dr. Black's findings in regard to the non-liability of the dentine of so-called soft teeth to decay, provided the surroundings, or, as he says, environments, are not promotive of that process.

But what, in few words and plain English, does Dr. Black mean by this? So far as I understand, he means that frail teeth (and I will say frail to the cutting instrument also), if wholly covered by the protective enamel, or, where that enamel is defective, if the defect is made good by accurately inserted fillings of indestructible material, that that tooth or those teeth may be indefinitely preserved in health and usefulness if kept clean. My clinical observations, accompanied by my written records carefully kept since I began practice, amply demonstrate the truth of this position.

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[1] Read before The New York Institute of Stomatology, October 5, 1897.

Thus far I can follow Dr. Black's lead with great delight, but further than that I am not prepared to go. I find that my records teach me that the hard teeth that will strike fire with an instrument, as we all have doubtless seen at times, are invariably shorter, and consequently more rounded than those softer teeth (soft to the cutting instrument and of a chalky feel) that so often induce despair in the mind of the operator.

In a communication which I had the honor to make to the Société Odontologique de France in December, 1884, I stated as a result of long observation, "that if the crown of the human tooth is well formed it is more or less yellowish, short and rounded, more slender at the neck, and should only touch its neighbor at a single point, if the arrangement of the teeth in the mouth is what is called normal or ideal, and it will be noticed that this point is almost never attacked by caries; it is the region between this exact point of contact and the gum where proximal caries makes its first attacks.

"If, on the contrary, the tooth is frail and of a loose texture, it is more or less light in color, it is long instead of being short from the neck to the points of the cusps, narrow upon its antero-posterior diameter, broad from one side to the other laterally, and flattened. Teeth offering these characteristics are always more subject to caries, and very often they are irregularly placed in the mouth, which allows food to be crowded between the teeth, and often it cannot be removed." I should, perhaps, not have the hardihood to recall this communication were it not that my records fully bear out the statements there made in regard to a fairly large number of patients that I have been enabled to see from time to time during from ten to twenty-five years or more.

These statements were based upon the hypothesis mentioned above, that dense-looking and yellowish teeth, if only coated with enamel or with indestructible substitutes for the enamel where the enamel is defective, are less liable to caries than teeth of the opposite description.

And this for mechanical reasons,—namely, that their formation is such that they are less prone to catch and retain particles of food between or around them than teeth that are differently formed and frequently differently placed in the mouth.

It will be noticed that this in no way militates against the statements, taken altogether, made by Dr. Black, for he simply antagonizes the notion that what are called frail teeth are necessarily doomed to destruction.

I regret that Dr. Black's investigations do not yet lead him into the field of enamel, for while the enamel is intact the dentine does not decay.

I should expect to be confronted with the appearance well known to microscopic observers, of quite large decalcified spots in dentine where no perceptible opening exists in the enamel; my reply to that would be that I have not yet seen or heard of cases in which the enamel covering was properly formed, where anything more than interglobular spaces were found in the dentine, but I have several slides where beneath defective enamel quite large disintegrations exist in the dentine.

If clinical observations are to be admitted into this discussion, permit me to say that I have two lady patients in America and one in Russia whose teeth have been under my observation from fourteen to twenty-four years, the teeth of all of whom can be cut down about as a slate-pencil could, and yet no one of these ladies has ever lost a tooth, and only the one in Russia during her confinement had pain in her wisdom-tooth. Some of the fillings put in fourteen and more years ago for all these ladies are still in their places, and quite a large number have been in place more than ten years; two of these ladies are or have been the mothers of four or five children each. The Russian has teeth that are badly formed, flattened at the sides, and very difficult to cleanse, and yet they are all being preserved, and best of all are the gold fillings wherever I was able to use gold.

DR. G. V. BLACK'S CONCLUSIONS REVIEWED.[1]

BY DR. B. HOLLY SMITH, BALTIMORE, MD.

Since the publication of Dr. Black's conclusions in reference to caries, and the description of the equipment and laborious experiments which seemed necessary in order to partially investigate the subject, it has been apparent to the casual observer who has a disposition to be honest that an element of unfairness must be manifested by any one who would rush into a discussion of the subject without greater thought and investigation than the average practitioner has opportunity for.

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[1] Read before The New York Institute of Stomatology, October 5, 1897.

From several sources suggestions, resolutions, and appropriations have come for the encouragement of similar work on the further prosecution of Dr. Black's labors. This, of itself, is an evidence that the members of the dental profession have confidence in the value of the work already done, and appreciate the fact that if definite conclusions are to be reached it must be through men who have special talent, opportunity, and equipment. There is, however, a phase of the question through whose discussion we may reasonably hope to aid the investigators, and that is the clinical aspect. The announcement has been made that Dr. Black's theory is entirely at variance with commonly accepted opinions based on clinical experience, but it seems to me not very hard to harmonize Dr. Black's theory with clinical observations. The inharmony at first apparent may result not so much from any fallacious deductions of Dr. Black's as from the long-standing misconceptions of those who have written and thought upon this subject.

The theory that disintegration and loss of teeth by child-bearing women is due to an extra demand for lime salts is unreasonable and untenable, since the process thus becomes a physiological one rather than pathological, while in the light of Dr. Black's discoveries and formulations the altered and perverted secretions known to exist during pregnancy become prime factors in a pathological process which is not arrested by any degree of density of tooth-structure.

Again, the sudden deterioration of teeth which for many years have been free from caries has been heretofore almost without reasonable explanation. A case in my own practice, which is possibly no more typical than has been observed by every practitioner, I will cite. Captain L., with a record of twenty years' police service, upon retirement was in possession of a perfect denture; so far as known no caries existed. He accepted in-door employment of a sedentary character, and three years later had between twenty and twenty-five cavities filled. In the next five years he was almost constantly under my care, visiting me every few months, nevertheless lost the pulps of several teeth; two were extracted and some crowned. A few weeks would often suffice for caries to make its way to the pulp of a tooth, which had the appearance of great density, and whose history would indicate it to be dense.

Since the promulgation of Dr. Black's theory this mouth has been painstakingly treated with antacids and antiseptics, with the results that no teeth have been lost and three stoppings have been introduced during the past year.

Surely there is a vista of hope opening out in the direction of this new theory, which we expect to see broaden into a plain and easy method of salvation for sick and sore dental organs.

Abstracts and Translations.

A FEW CONSIDERATIONS ON THE LEPTOTHRIX BUCCALIS.

BY T. CHOQUET, D.E.D.P., PARIS.

In a paper presented in my name and in that of Mr. Grimbert at the Dental Congress held at Bordeaux in 1895, I mentioned, among the microbes I had succeeded in isolating from the mouth at the same time as the coli bacillus, the presence of a leptothrix buccalis. The separation and the obtaining in pure culture of this microbe was effected by the use of the phenicated bouillon, which Dr. Peré had suggested for the study of the coli bacillus. Since then I have continued my researches, and I have to-day the honor to submit to you the few observations I have been able to make.

By the method of the phenicated bouillons one can isolate in pure culture from the buccal cavity several species of leptothrix, differing from each other either by their biological and morphological nature, or by their chemical reactions. But, first of all, what has until now been and is still understood by the denomination of leptothrix?

Among the numerous species which Leeuwenhoek was the first to discover in the saliva (though at that period the microscopic investigation was no easy matter), he had signalled the presence of a segmented thread of great length and without movement, or rather, presenting an almost imperceptible oscillating motion. Robin had studied this microbe and had at last given a good description of it from a purely microscopic point of view. It is this author who first attributed to it the genesis, the formation of the other microbes which are met with in the mouth.

This theory has been taken up some years since by a learned Italian, Filandro Vicentini. While rendering due honor to the care taken by him in his experiments and researches we cannot partake in his ideas. There may be some truth in the theories

which he maintains, but bacteriology is a science of too recent date, and until the contrary be proved we shall consider the leptothrix as a peculiar species, a pure species.

According to the definition given by Professor Flügge, the species which interest us belongs to the leptothricæted class, and show filaments with or without sheath, the division of which does not extend far, and of which the cells do not contain any sulphur. These filaments are sometimes isolated, at others grouped in bunches, in tufts, entangled in each other, as one can see in examining certain advanced carious cavities, the walls of which are sometimes lined with these tufts.

The direction of these filaments is not always straight, it is even slightly waving. According, too, as one has to do with one or another kind cultivated in a nutritive medium, or in a different one, one will find one's self in contact with thin and lengthy filaments, or with short and thick ones.

The leptothrix are easily stained by most staining agents. They take the Gram method, which imparts to this microbe a fine black-violet tint. On attentive observation of certain species, spores in course of formation may be distinguished.

The following is the receipt for a staining solution which I have made, and which, when followed by impregnation, according to Van Ermengen's method, shows very distinctly the spores of the leptothrix buccalis, and of most microbes growing by sporulation:

Victoria blue....................................	gr.	0.25
Methylene blue..................................	"	0.25
Absolute alcohol................................	"	25.00
Distilled water..................................	"	125.00

When the preparation is fixed on the glass slide a few drops of the above solution are poured on, and one can, if one wishes, heat it for five or six seconds over a small Bunsen-burner flame until the vapor subsides. Wash well and continue with the silver method, and a result can be obtained in two or three minutes.

Does this mixture act as a corrosive? I do not know; but, thanks to it, Van Ermengen's method is greatly simplified, and the spores are distinctly apparent in black in the interior of the light or dark-blue tinted filaments.

A thorough reaction, which Miller was the first to give, is the reaction of iodine, combined with some acid, even a weak acid, which reaction causes the microbe to assume a violet tint, and allows it to be distinguished from most of the other microbes which are met with in the mouth and which do not present this reaction.

We know that the leptothrix is found in the buccal cavity; but which is its favorite abode, and can it be met with elsewhere? Its favorite abodes are the dorsal surface of the tongue, the dental interstices, and the tonsils; also sometimes in carious teeth, where it is met with in tufts in the margin or in the bottom of the cavity. It is also found, but by chance only, in the concretions of the lachrymal pipes (Jaffé), in the expectoration of pulmonary gangrene (Leyden, Craube). Weigert has also met with it once in an abscess of the tongue.

It is normally met with in the mouth of healthy persons, but it is very difficult of cultivation on account of the sort of microbic antagonism which appears to exist between this species and the other species which compose the microbic flora of the mouth. These species stop and choke the development of the leptothrix. It is to be met with—and this is an entirely personal opinion—very frequently and in an almost pure culture in the mouth of idiots, of weak-minded persons. In this case *the saliva* is literally filled with it. In the mouth of three idiots of eighteen, twenty, and twenty-seven years of age residing at home, and of whom no care was taken, including no special care of the mouth, I have found it *three times*, and not in the tartar nor in the amygdalin crypts, but simply in the saliva reposing on the point of the tongue. It is with these three cases that this paper is concerned. I wished to undertake further researches in lunatic asylums, and thanks to the kindness of Dr. Bourneville we have been able, my colleague Dr. Durand and myself, to make at Bicêtre in the lunatic section about one hundred experiments in connection with the study of the leptothrix. We have, unfortunately, met with an almost total failure, on account of the too great cleanliness of the patients' mouths. Every morning the inspectors force the children to clean their teeth, and rare are those in whose mouths tartar can be found.

To run a chance of finding leptothrix in an idiot's mouth, or in one of feeble intellect, it is necessary that the health of the mouth be less cared for. Does the general state favor the increase of the leptothrix to the exclusion of other microbes? I leave to others the care of developing this question and giving a reply.

Besides the human mouth it is also found in the buccal cavity of most animals, such as dogs, sheep, and oxen. Miller has found it in the mouth of a dog suffering from pyorrhœa alveolaris. To this species he has given the name of leptothrix gigantea. Dr. Phisalix, professor at the Museum of Natural History of Paris, has assured me he had found a species of leptothrix in the throat

of a stork. From this it is observable that this microbe may be met with in almost all mouths. When it is met with in the human throat it is on the lateral surfaces of the tonsils in the form of small yellowish spots, easily detachable by the platinum wire used for the inoculation.

Has the leptothrix a pathogenic action?

It would appear so, according to Leber, who, by inoculating it on the cornea, is said to have produced on the latter a serous suppuration. But Leber does not say in his remarks whether he inoculated a pure culture of leptothrix or if he inoculated only a small quantity of buccal mucus. It would rather appear that this latter assertion is the true one, for most authors agree in saying that the leptothrix is not cultivable. Vignal and Rasmussen alone, eight or ten years ago, succeeded in studying it in pure culture. Rasmussen appears to have attained this by means of gelatin and potatoes. Unfortunately he gives no details of the method which he used.

Vignal (*Archives de Physiologie*, 1887), after numerous experiences made in 1885–87, has given an excellent definition concerning the species, and also of the morphological characters. He was, we believe, the first to draw the attention of bacteriologists to the difficulty of cultivation of the leptothrix, and especially of its isolation from the other species.

For my part, I am absolutely persuaded that he had studied one species only, for the result which he gives is different from that obtained by me. Moreover, it proves most surely that there is not only one kind of leptothrix, but different sorts, as you will soon be able to judge.

He advised the inoculation to be made with dental mucus and tartar very much diluted. The following are the observations he had made in the different mediums of cultivation: (1) *Bouillon.*—The leptothrix disturbs it slightly and forms a white deposit at the bottom of the tube. (2) *Gelatin in puncture.*—Boil culture with a head and paint. Liquefaction like a funnel at the end of three or four days. (3) *Gelatin in plates.*—The colonies make their appearance at the end of three or four days in the form of whitish spots, denticulating about the fifth or sixth day. They then become of a dirty white with an opaque centre and semi-transparent border. Then the gelatin becomes soft and ends by becoming perfectly liquid. (4) *Potatoes.*—Dirty white spot growing very rapidly. (5) *Agar-agar.*—35°–38° C. The inoculations appear at the end of twenty-four hours. Same aspect as on gelatin.

Vignal added that on microscopic examination he had been able to see very distinctly with a high magnification in the inner part of the filamenta the presence of transversal sections on the preparations stained by aniline colors. In this, he differs totally from Robin, who said that *no* trace of articulation was *ever* met with in the filaments.

Here, then, is another proof that there is more than one variety of the microbe which interests us. And this is absolutely the opinion of Miller, who, as you know, has carefully studied the question, and is in a position to speak learnedly on the matter.

Here is the description of the three cases in which I have succeeded in obtaining in *pure culture* the leptothrix.

I specially draw your attention to the difference existing between these species.

Case I.—Miss H., aged eighteen. Insane. Very bad state of mouth. Soft tartar. Hypertrophied gums. Mucus taken on the tip of the tongue. (1) Inoculation in phenicated bouillon, which is put in the incubator at 36°–37° C. *Four hours* later complete disturbance. Second inoculation with this bouillon in another tube of phenicated bouillon. Four hours later, complete disturbance. A plate of gelatin in Petri's box is made with this second result. At the end of two days whitish colonies, causing *no liquefaction* of the gelatin, these colonies spreading more and more without liquefaction. (2) *Ordinary bouillon.*—Complete disturbance at the end of four or six hours. The bouillon remains dense, and shows at the end of two or three days a *thick film.* No clearing. (3) *Lactose.*—Steady fermentation. *Peptone.*—Nothing. *Potatoes.*—Thick, whitish trace. *Microscopic examination.*—Long segmented filaments, presenting very *clearly defined articulations.* Takes the Gram and all aniline dyes. Examined without staining, in damp chamber they present a to-and-fro movement barely visible. Purple coloration by iodine and acetic acid.

Case II.—Mr. Z., aged twenty. Idiot. Appears but twelve years old. Mouth in a very bad state. Saliva taken for inoculation. (1) *Inoculation in phenicated bouillon.*—Dense after twelve hours. Presents the same character as that described by Vignal, as also the liquefaction which No. 1 did not produce. (2) *Lactose.*—Nothing. (3) *Peptone.*—Nothing. (4) *Potatoes.*—Whitish trace.

Case III.—Miss P., aged twenty-seven. Idiot. Very bad state of the mouth. (1) *Inoculation of saliva in phenicated bouillon.* Incubator at 36°–37° C. Disturbance after six hours. Thick film on the surface. (2) *Gelatin in plate.*—Same colonies as in No. 1

without liquefaction, even at the end of three months. The colonies appear from twenty-four to forty-eight hours. (3) *Lactose.* —Very defined fermentation. (4) *Peptone.*—Reaction of indol with the azotite of potash and sulphuric acid. (5) *Potatoes.*—Hardly visible traces. *Microscopic examination.*—Voluminous filaments presenting a well-defined segmentative and spores brought to light by the blue solution which I have mentioned, followed by impregnation of nitrate of silver. The envelope does not take color. Here, then, there are three different species of leptothrix, resembling each other in the appearance of their colonies, but differing from each other, either by the form of the microbe, or, and above all, by the nature of the cultures. In one case the gelatin is liquefied, in the two others it is not.

In two cases we find fermentation, whereas in the other we have none. Lastly, one case gives us the reaction of indol, while the two others do not. I think it is not necessary to add more to show the plurality of the species of leptothrix. This work is certainly not complete, I allow, since I have not been able to ascertain the degree of pathogeny which the species possess; but I wish to present to you these results, and hope at a future Dental Congress to acquaint you with any more results that I may obtain.

To conclude, I wish to draw your attention to the similitude of the colonies that three different sorts of microbes can present which might be confounded with the leptothrix. These are the zopfii, the coli bacillus, and typhic bacillus, but especially the zopfii. It is true that a simple examination with the microscope would suffice in such a case to avoid confusion with the leptothrix, being all three simple bacilli, and not attaining the tenth part of the length of a filament of leptothrix.—*Journal British Dental Association.*

Reports of Society Meetings.

AMERICAN DENTAL ASSOCIATION.

(Continued from page 754.)

August 4, 1897.—Second day.—Evening Session.

The meeting was called to order at eight o'clock by the President, Dr. Truman.

The Secretary read the minutes of the previous session, which were approved.

Dr. Richard, President of the Southern Dental Association, was invited to a seat upon the platform next to President Truman.

Dr. Fillebrown read the report of the Committee on Union of the two societies, after which Dr. Marshall moved that the Committee on Union be requested to arrange for a convention of the members of the two Associations to consider the subject.

Motion carried.

Dr. Fillebrown, the Vice-President, then took the chair, and Dr. Patterson read the report of the Committee on the President's Address, as follows:

REPORT OF THE COMMITTEE APPOINTED BY THE AMERICAN DENTAL ASSOCIATION TO CONSIDER THE RECOMMENDATIONS EMBODIED IN THE ANNUAL ADDRESS OF THE PRESIDENT, DR. JAMES TRUMAN.

To the Members of the American Dental Association:

Your committee confidently expect that the proposed union of the American and Southern Dental Associations will shortly be consummated, and their recommendations, therefore, are made to the Association about to be created by such union.

We recommend that all delegates to the Association shall be practitioners of dentistry, who shall be selected by State Dental Associations at a regular meeting of the association which they represent, and that they shall be men of recognized merit, and duly selected by a majority vote of such State organizations.

We recommend that one delegate shall be allowed for every ten members of such State organizations.

Your committee believes that with such careful election of dele-

gates the formation of an aristocracy so forcibly described in your President's address would be prevented.

Your committee recommends the timely recommendation that some method shall be adopted by which a fund shall be created by the National Association which shall be devoted to original investigation, such fund to be used in enabling competent scientists in the profession to prosecute investigations without being harassed by the usual strife and annoyance encountered in dental practice.

Your committee is in perfect harmony with the President where he says that the degree of any State should be a law for all other States, and that a practitioner who is properly licensed in one State should be allowed registration in any, and that this Association should advise all of its members to work for the accomplishment of this desirable end.

In regard to the dental education and to the conflict which has arisen between the National Association of Dental Faculties and the National Association of Dental Examiners in respect to educational methods in the profession, to which extended reference is made in your President's address, your committee is of the opinion that there is no reason which should prevent harmonious relations between these two bodies. The aims of the National Board of Dental Examiners have been in the proper direction. They have been invested with authority by the various States to guard the community interests where they exist, and while individual members of the board have expressed unwise individual opinions, the public and majority action of the Examiners' Association has so far not exceeded their lawful and legitimate functions. They are entitled to our respect, and invite harmony with the National Association in dental education.

Your committee, while concurring in the majority action of the Examiners' Association, desires to pointedly criticise the method in some States of granting temporary licenses to practise, and would earnestly advise that efforts be made to change the laws permitting such licenses without any examination whatever.

In furthering the intent of the President's address, your committee desires to deplore the lack of interest in the national associations, evidenced by a considerable portion of both the membership of the National Association of Dental Faculties and the National Board of Dental Examiners, in that they have not and evidently do not desire to work with the National Association. So soon as the business of these two Associations is finished many of the members at once return to their homes. This is done in

face of the fact that, of all associations, the National Board of Dental Examiners and the National Association of Dental Faculties should be the most loyal to national organizations, and thus further the community interests of dental education.

In conclusion, your committee feels that nothing will be gained by exalting the work of one or belittling the work of the other.

J. D. Patterson, *Chairman.*
G. Molyneaux.
H. B. Noble.

Dr. Molyneaux then made some supplementary remarks regarding the President and his work in the profession.

Dr. Peirce moved that the report of the committee be accepted and taken up as the first order of business to-morrow morning.

The report of Section IV. was then read by Dr. Wilson; an abstract follows:

Section IV., Histology and Microscopy.

This section has sustained a great loss during the past year. Dr. Frank Abbott, who has been chairman of the section every year, with two exceptions, since the establishment of this branch of study in this Association, has passed away. On examining the transactions of this Association, I find that the first researches ever conducted in this country to determine the etiology and progress of the carious process in human teeth were conducted by Dr. Abbott in 1878; and I learn also, from the records, that nearly every pathological condition found in these important organs has been microscopically studied by him, and the results obtained have been from time to time reported to this Association. Only twice since the establishment of this section has he failed to contribute a valuable paper.

Dr. Abbott has kept this section alive. In 1894, at Old Point Comfort, he was the only member of the section present. But he realized, as we all must, that the wealth of this comparatively new field of research has not been exhausted, and has yet in store for us rich fruitage. Only a short time before his death he wrote me an earnest letter regarding the work of this section, and expressed a desire that we secure if possible a greater interest in this important line of investigation.

The Transactions of the American Dental Association for a score of years are richer because of his untiring researches. If the pages of our dental journals are to be regarded as an index to

the histological and microscopical investigations of the past year, but few have been engaged in this line of study. It is with pleasure, however, that we call attention to a paper read before the New York Odontological Society last January by Dr. J. Leon Williams, of London, England, entitled "A Contribution to the Study of the Pathology of Enamel."

This paper, illustrated by about one hundred photomicrographs, was published in the *Dental Cosmos* of March, April, and May of the present year, and should be read and carefully studied by every member of the dental profession. This paper certainly marks an epoch in the development of dentistry. While it is true Dr. Black had in some sense foreshadowed what Dr. Williams has brought regarding the influence of films formed by micro-organisms, it has remained for Dr. Williams to demonstrate it. This clear demonstration by Dr. Williams fully merits the credit of discovery. His study of the teeth with reference to their liability to caries is also very important, especially the studies of the condition of the enamel.

One paper only has been secured for this section, by I. Norman Broomell, of Philadelphia, entitled "Macroscopic Tooth-Development," illustrated with lantern slides from original dissections.

Dr. Crouse.—I would like to have a committee appointed to audit the accounts of the Dental Protective Association.

The President.—I appoint as such committee Drs. Patterson, Rich, and Noble.

Dr. Fillebrown moved that this Association adjourn to-morrow at 12.30 o'clock, to meet with the Southern Dental Association in order to consider the question of union.

Dr. Broomell then read his paper, illustrated with various lantern slides. This very valuable contribution was mainly a description of this original work in the various pictures presented.

Dr. Marshall.—I want to express my appreciation of the exhibit upon which we have just looked. Any one who has ever attempted such dissections knows what an amount of work there is attached to it. Dr. Broomell is entitled to the thanks of this Association for what he has done, and I therefore move such a vote of thanks to him.

Carried unanimously.

Adjournment.

(To be continued.)

THE NEW YORK INSTITUTE OF STOMATOLOGY.

A REGULAR meeting of the Institute was held Tuesday evening, October 5, 1897, at the residence of Dr. Benjamin Lord, No. 34 West Twenty-eighth Street, New York City, the President, Dr. George S. Allan, in the chair.

The minutes of the previous meeting were read and approved.

Dr. W. St. George Elliott.—I would like to ask for some opinion in regard to a little difficulty I have had in the cataphoric destruction of pulps. I have had two cases where there was marked sensibility of the surface of the tooth and a great deal of pain on attempting to drill. While both were very sensitive, in neither case was there any pulp structure apparent. Yet the pain entirely subsided under cataphoric treatment and the canals were drilled out.

Dr. J. Morgan Howe.—Does Dr. Elliott mean that the pulp-canals were filled by secondary dentine?

Dr. Elliott.—Partly, but not completely. In one case there was a little hemorrhage at the extreme end; in the other case no organic matter at all, yet the extreme sensitiveness was there.

Dr. S. C. G. Watkins.—Was the canal large enough to insert a broach?

Dr. Elliott.—Yes, a very fine broach.

Dr. C. F. Allan.—If there were no pulp, and if the canals were not completely ossified, it is difficult to suggest or see what there could have been in the teeth to give pain.

Dr. Elliott.—My impression is that there was a pulp in both cases, but of exceedingly filamentous character and not readily recognized.

Dr. C. F. Allan.—I will speak of the obliteration of two pulps, one of a superior cuspid and the other of a central incisor, by entirely different means, under different circumstances, both accomplishing very excellent results. In the case of the central incisor, a blow had been received from a golf club, the tooth crown being splintered. It was in a number of pieces, seemingly held together solely by the central connection with the pulp,—splintered up on the labial and palatal face of the root, about a quarter of an inch. The patient came to me just at dusk, suffering a great deal, and the only thing I could think of doing at the time was to make a splint of German-silver plate, very thin, putting pieces smeared over with oxyphosphate on the front and back, simply tying them together

to hold the splintered tooth in place until the next day, when I could do something better. That gave relief until his next appointment. When he came again, considerable pain was caused by the removal of the pieces of the crown. Having done that (the case being one in which cataphoresis could not be used, as the tooth could not be kept dry), I used trichloracetic acid, and in an hour had the pulp-chamber clean to the end of the root, and the patient said the pain was hardly worth mentioning. I used the actual crystals of the acid so as to have the most prompt action possible.

The other case was one of cataphoresis. That was a cuspid. The man was about sixty years of age, and the wear on the tooth had gone on more rapidly than the reparative process of the pulp, and the tooth was very sensitive, the tooth-structure between the outside and the pulp being quite thin. The pulp would have to be destroyed, because I wanted to "shoe" the tooth, as the term goes, with platinum and gold, making a surface as hard as possible. In that case I applied cataphoresis, and at the end of half an hour, giving it full time, as I thought, to make a complete penetration, I was enabled to take out the pulp without any trace of pain. This case was one well adapted for cataphoresis, and the result was what might have been expected.

The President.—We will now take up the subject of the evening. The Executive Committee some weeks ago sent to various gentlemen extracts from the conclusions and statements of Drs. Black and Williams that "liability of teeth to decay is determined only by environment and not by structure," and we are able to present this evening the replies that have been received. Every little while something happens in the profession that sets us all thinking. We have preconceived opinions and ideas on theory and practice, and they are more or less disordered by what we see and hear, sometimes of a very startling nature. After reading these views that Drs. Black and Williams have promulgated, and which have been so largely circulated in the magazines, most dentists put an interrogation mark to their ideas. In the hope of reaching the profession more generally, and of finding out to what extent these opinions have been accepted as true, or should become acknowledged as true in practice, our Executive Committee has taken this means of having the discussion brought before the profession.

We have with us Dr. James Truman, of Philadelphia, and I will now call upon him to tell us his ideas of the subject.

Dr. Truman.—When I received the invitation to be present with you I was somewhat at a loss to know how I was expected to treat

the subject. I subsequently found that this meeting was to be a sort of symposium on Drs. Black and Williams, and I concluded that it would be best to write out my views, and I, therefore, present them for your consideration.

(For Dr. Truman's paper, see page 796.)

The secretary then read papers by Drs. George A. Maxfield, R. R. Andrews, B. Holly Smith, E. A. Bogue, S. B. Palmer, and Mr. Charles Tomes.

(For these several papers, see pages 781–814.)

A letter from Dr. W. D. Miller, of Berlin, was read, stating that as the writer had been prevented by ill health from studying thoroughly the published accounts of the recent work of Drs. Black and Williams, he felt that any expression of opinion by him would be unfair and without value.

The President.—We also have a short communication from Dr. W. H. Potter, of Boston, which the secretary will now read.

Dr. W. H. Potter.—I am of the opinion that in the matter of dental caries there are two factors to be considered:

1. The condition of tooth-tissue.
2. The environment of the tooth.

I feel confident from observations made in practice that some teeth offer a greater resistance to unfavorable environment than do others. I should, however, find it difficult to say which was the more important agent in producing caries, a bad environment or defective structure. I believe that as the lung-tissue, on account of the make-up of its substance and from its inherent vitality, can resist the attacks of tubercular bacteria, so the teeth by a superior chemical composition, joined with a vitality coming from the pulp, can resist the unfavorable effects of environment. It is not simply a chemical problem which we study but a chemico-vital one.

DISCUSSION.

Dr. C. S. Stockton.—I have but little to say, as I am somewhat "at sea" on this subject. With eminent men on one side and equally eminent men on the other, their theories and practice seem to be directly opposite. It is very much like the charge of the justice of the peace to the jury,—"Gentlemen, if you believe the distinguished lawyer on the one side you will find a verdict for the plaintiff, and if you believe the equally distinguished lawyer on the other side, you will find a verdict for the defendant; but if you are like me, you won't believe either of them." Those of us who are laymen, so to speak, in this advanced scientific development

regarding the destruction of teeth, do not know where we are. It seems strange that a man like Dr. Potter should make the statement he does. Of course we all know that the structure of the teeth and their environment are the two topics under discussion to-night, and that these two factors cause the destruction of teeth. Take what we call a soft tooth and put it in the surroundings that some hard teeth have, and that soft tooth will become a useful organ. Take what is termed a hard tooth with different surroundings and environments, and the tooth is lost. Take a child born into the world with the best circumstances and surroundings that can possibly exist, one who has been brought up with all the care that love can lavish upon it, place it, before its character is fully established, in the slums and places where it imbibes everything that is bad and evil, will it remain good? Will it adhere to the teachings and principles that it had when it was young? I think not. This is very largely so in regard to this matter of the decay of the teeth. Only this morning I saw a patient who takes the best care of her teeth; on the coronal surface of a cuspid, where it seems almost impossible for anything to lodge, was a cavity. What caused it? I do not know whether it was Professor Truman's theory of chemical action or Dr. Black's theory of microbes. These are times when the men who are leaders, and who have been for years making special study of this subject, should be able to tell those of us who do not know so much what it is that causes the destruction of teeth and how to remedy it.

Dr. E. S. Niles.—I came here rather to listen than to impart any ideas. We all have our own theories regarding decay, and could hardly practise our profession without them. During the past year I have had my mind directed upon new lines, which came to me through the use of nitrate of silver. We know practically that nitrate of silver is an antidote for decay; that if we apply it to a cavity where decay is progressing the decay is arrested. To me this is one of the most important facts that has come under my observation since the discovery of microbes and the presence of acids. I am not prepared to-night to give the results of some substitutes that I have been using to produce the same effects as nitrate of silver. My theory as to the practical action of nitrate of silver is this: nitrate of silver retains all the coagulating power that is produced with nitric acid. Metallic silver in itself is negative; in most of its salts it is somewhat antiseptic; but it is more active in the nitric acid preparation. The great hinderance in the use of nitrate of silver is its discoloration

when exposed to the light, masking its chemical action after a time. Where decay was abundant the yellow precipitate produced by nitrate of silver, observed before it turns black, gave me the hint as to its chemical action, and it at once called to my mind some experiments in which I proved to my mind the presence of an important factor in decay. The nitrate I then used will not discolor the caries, and I have had some satisfactory practical tests. It is my intention to give it to the profession a little later on. To me the practical results of these chemical changes furnished the clue to dental caries. I will tell how to produce this yellow precipitate out of the mouth. It is an old recognized reaction in chemistry. Take a solution of phosphate of lime and add a solution of nitrate of silver, the yellow precipitate will soon follow. The nitrate I refer to will cause the same reaction. I am impressed that there is in decay a retrograde metamorphosis or change of tooth structure in the tooth similar to that in digestion, where many factors are at work. One investigator finds germs, another acids. Scientists tell us that there are certain germs which are essential to perfect digestion. This question of decay is a complex one, and it has been well studied on certain lines, some of which have been brought before us to-night; but like the man who hunted for the mouse,—he searched all around the barrel while the mouse was in the meal in the barrel. We know beyond a doubt that there is acid in dental caries, but I am not convinced that it is wholly lactic acid, or acetic acid, or germs, because there are not materials enough about the teeth to keep up a constant supply of acid to do the amount of work found in decay.

Dr. J. Morgan Howe.—In the presentation of views it seems to me not necessary that they be regarded as antagonistic in an objectionable sense. Nobody antagonizes facts. We are thankful to Dr. Black and to Dr. Williams for the facts that they have given us. The differences of opinion that have been brought out are differences of deduction from the facts, not only from those presented by Drs. Black and Williams, but from the other facts accumulated from the store of knowledge that has come down to us from ancient times, from our own experiences, and from the record of the reliable observation of others. If different conclusions must be entertained than those arrived at by scientific observers as the results of their laboratory experiments, it is no disparagement of those who give us the facts obtained by research. Dr. Miller concluded from his experimental production of decay out of the mouth that teeth vary very much in their resisting power, as

shown by the different conditions presented by numerous pieces of teeth subjected to the same influence; and I think it would be a fair test of the liability of teeth to the inception of decay to subject a number of them to tests in a similar way. We are not bound to accept the conclusions of any one when the conditions can be tested, but we gladly accept every fact that can be added to our store; and the testing of the question, whether environment is the only factor in the liability of teeth to decay, would give us another fact instead of a deduction.

The President.—There is a most astonishing unanimity of opinion in the various papers we have listened to this evening concerning the conclusions of Drs. Black and Williams. It would appear that the profession does not accept them as correct. It is a little surprising that no one writer or speaker has approved of them. The time will not permit me to ask for further opinions and remarks, so I will ask Dr. Truman to close the discussion, as he is the only representative of those who have written papers for us on this subject who is present.

Dr. Truman.—I think I practically stated my side of the subject in the paper I presented. I cannot quite understand in one of the papers why the question should be raised as to why micro-organisms flourish in tooth-structure. Miller fully settled that matter long since, that the excreta of the micro-organisms, or lactic acid, was taken up by the lime of the teeth, thus enabling the micro-organisms to flourish. We all know that micro-organisms die sooner or later in their own toxin.

Dr. Williams positively states that micro-organisms are the cause of enamel destruction. This I have endeavored to prove has not been demonstrated, and I think I could show, had I a blackboard, that those organisms can be found in all dense-structured teeth, and not in the chalky teeth to any considerable extent. Twenty-five or thirty years ago I explained to my classes that in all probability these were a powerful factor in producing dental caries in dense teeth. Those pictures represented in the illustrations so beautifully by Williams are, to my view, simply agents in holding the acids of the mouth against the enamel. As I stated in my paper, no authority that I know of has ever demonstrated that they are acid-producers, and I therefore criticise Williams on the point that he has stated things that have not been scientifically demonstrated, and when he undertakes to assume that caries is produced by those organisms he has gone beyond the region of facts.

Dr. Davenport moved a vote of thanks to Dr. Truman and to the authors of the various papers.

Carried unanimously.

Adjourned.

S. E. Davenport, D.D.S., M.D.S.,
Editor The New York Institute of Stomatology.

Editorial.

THE RECORD OF THE YEAR.

The good business man at the close of the year takes account of stock, estimates profits and loss, and arranges for the future. A profession should in the same way and for similar reasons devote a portion of its time at the same period to a summing up of its gains and losses during the past twelve months, that it may treasure the one and avoid the mistakes that led to the other.

In some degree the past months have made history which may leave its mark on the future, it is hoped for good, and, on the other hand, it is thought something has been lost.

The close of the year finds dentistry in the United States in its organized capacity in somewhat of a chaotic condition ; and while the pessimistic state of mind is very rarely, perhaps, the best, it is impossible to look forward to the coming year of 1898 with the same feeling of confidence that opened the year 1897.

The dental profession at that time looked forward with satisfaction to a year of positive advancement in organized effort. The various bodies, both State and local, gave the subject of reorganization special consideration. It was discussed, as never before, publicly and privately, with the result that the final action at Old Point Comfort in August left the matter practically as it was prior to that event.

This subject has been considered in a previous article, and it is mentioned here simply as an illustration of the active thought at the beginning of the year. There has been reorganization. The American Dental Association was permitted to die and the Southern to live. A partial union of the associations North and South was effected, and dentists everywhere are promised that this will result in all the good anticipated. At present the "wish seems father to

the thought," for the signs in the professional heavens do not seem propitious.

When January, 1897, opened the year, harmony reigned in college circles. The National Association of Dental Faculties held out the hand of good-fellowship to the National Association of Dental Examiners, notwithstanding many disagreeable antagonisms. That body permitted itself to be dominated by bad advisers, with the result that the close of the year finds the dental colleges of the United States in direct antagonism to that organization and almost in open war against laws regulating practice in general. That this is to be lamented requires no word from this journal, but that it is to be wholly regretted cannot be written, for it is through violent ebullitions that an equilibrium is established in the mental as well as in the physical world. Hence these disturbed relations are not regarded as an unmixed evil, but rather a necessary condition prior to that period which will surely come, when all conflicting interests will be arranged upon a satisfactory basis.

The progress professionally has not been marked during the year. While there has been activity and some noted contributions to the literature of the profession, there has been no special work that distinguishes this year from those that preceded it. This was to be expected, for dentistry has its limitations, and while it is not "written up," as expressed by another, it is vain to anticipate any great revelations in the near future. We, as dentists, must labor on, perfecting the old lines and accepting the new as they appear in the progress of events.

The most encouraging feature of the past year has been seen in dental educational circles. This to some may seem to be an absurd statement in view of the fact of the action of the National Association of Dental Faculties at Old Point Comfort; but it is nevertheless true that college work and the real standard of that body, and those associated with it, has made marked advance in the past twelve months. The writer of this has, perhaps, a quite intimate knowledge of the work of the schools, and he feels convinced that at no period has there been a more earnest desire to eliminate all that is defective than at the present time. There was nothing of a retrograde character at Old Point, nor has there ever been in that Association but one feeling,—that the schools must progress as fast as circumstances would permit. There is a feeling abroad that there are too many schools. This may be true, but it is doubted, and the cry of commercialism is heard everywhere. While this to

some extent is justified, it must be remembered that nothing involving financial outlay can be carried on successfully without business methods. It should also be considered that the majority of the smaller colleges are kept alive through great sacrifices on the part of the faculties, and the huge emoluments so often and so offensively stated are, in the main, pure myths. It is a gratification, therefore, that men in the past twelve months have been found willing to make sacrifices for the good of their calling by engaging in a labor the only returns of which can be found in the satisfaction of helping along educational work. The attitude of many towards these educational labors has no justification, and constitutes one of the dark spots on the history of the passing months.

One of the most pleasing features for the present and the future is that the past year has given the dental profession an objective lesson in college work. At no period has there been greater efforts made to erect structures worthy of the labor to be performed in these training institutions. There is nothing which so gauges the real status of a profession as its buildings and appliances for teaching. Judged by this standard, the dental profession has grown the past year as in no period antedating this. Some of the colleges have erected large and architecturally beautiful structures, and with every convenience, not only for the teaching of dentistry proper but of all the collateral branches. That this has been only possible through a very large outlay of money need not be stated. Men do not invest from a hundred to a hundred and fifty thousand dollars in a building on mere sentiment, and yet sentiment, or a desire to meet the demands of the period, is the sole actuating motive. When critics carp at the non-progressive character of colleges they may compare these fine structures with the early beginning and then consider the question, Have colleges, and through colleges the dental profession, gained not only in the past year but in the past century?

There is, therefore, no need of discouragement. The disturbed condition of the present presages the period of calm. Better by far frictional activity than the dead level of inertia.

The past is behind us, the present is ours, and the future of possibilities lies before us. He is wise who accepts all and labors patiently, well assured that amid it all progress is the eternal condition of mentality, and the apparent lapses are intrinsically but the outward signs of that activity that leads forever to a higher standard.

SOUTHERN DENTAL ASSOCIATION.

The next meeting of this body will be held at St. Augustine, Florida, in February, 1898.

Thus under the old name is this announcement made, and to all appearances it is the same in fact. To this no one can object, for it was an understood conclusion, at Old Point Comfort, that it was to live, practically the same body as heretofore. If the logic of the situation had been as well understood by the members of the American Dental Association they would not have permitted it to pass out of existence.

In the language of the President, in the circular issued, it is to be in the future "an organization now of Southern dentists, *by Southern dentists and for Southern dentists*. . . . We are proud (the circular continues) of the Southern's past; we will be more proud of it in the future. We have a chance to show what we can do. We of the South are not behind any people upon earth. Our history has been a glorious one. We are descended from the cream of 'Old England,' and are less contaminated to-day by undesirable foreign elements than any part of this great Union. . . . They have now an organization all their own. They try to rival no one; but propose to show to the world what they can do for dentistry."

Whether this grandiloquent message will serve to arouse enthusiasm or not, it certainly exhibits a self-satisfied condition of mind, and shows a determination to keep the Southern intact, and that upon a purely sectional basis. The outcome will be awaited with interest, for upon that will depend the solution of the question, now somewhat in doubt, Did the Southern really unite with the American Dental Association to form a new body?

CORRECTION.

In the preparation of Dr. Davenport's article in the October number, an error occurred in the preparation for the press in reversing Figs. 1 and 2. They will, however, be readily understood as they stand upon the page.

Bibliography.

A Manual of the Injuries and Surgical Diseases of the Face, Mouth, and Jaws. By John Sayre Marshall, M.D. (Syracuse University), former Professor of Dental Pathology and Oral Surgery and Emeritus Professor of Oral Surgery of the Dental Department of Northwestern University, etc. Philadelphia: S. S. White Dental Manufacturing Company, 1897.

It is by no means a common experience to feel, after the examination of a new book, that it is entirely satisfactory in its special line of work, but this volume, prepared by Dr. Marshall, approaches very nearly this desirable position, and the author deserves special commendation for his very great, and it is believed successful, labor in placing the subject of surgical injuries and diseases of the mouth and jaws so satisfactorily before the dental reading world.

His idea of preparing such a work is explained in his preface, and as this book has been arranged on new lines, and for convenience of teaching, it is proper his reasons should be given for this departure from established custom. "The plan of this volume is the outgrowth of several years' experience as a teacher of oral surgery in medical and dental colleges. During these years the author has been more and more impressed with the disadvantages under which teachers and students have labored in the old system of teaching by didactic lectures. The same feeling has been growing year by year among the teachers in the American medical and dental colleges, and many of them have expressed themselves as anxious to adopt a recitation system of teaching in their special departments. The greatest objection which has been raised to the inauguration of such a system of teaching has been the lack of textbooks arranged upon a suitable plan for teaching by this method."

It is certainly true that the methods heretofore adopted in medical and dental teaching have followed very strictly the form of didactic lectures, and any departure from this ancient system of teaching has been frowned upon by the elders as being at once undignified and contrary to established precedent. On the other hand, there has been a growing sentiment among teachers in professional work that the old plan of didactic lectures has become antiquated and necessarily ineffective with the advance of knowledge in all departments, and that, therefore, the objective method

should to a large degree supplant it. It may be questioned whether either of these extreme views should be considered as correct. The old system has the positive advantage in permitting a broader view of the subject than would be possible in a mere series of talks with recitations following. This has the merit which the quiz-master possesses of fastening the subject in outline upon the memory. In the opinion of the writer a combination of the two is the proper course. This is apparently what Dr. Marshall proposes, and his method would be eminently successful, providing all teachers made use of his book and followed it closely; otherwise the questions added to each chapter would be of little value.

For the teacher who appreciates his own experience and personal investigation, simply superadding book-information as a supplementary work, this method would be very distasteful, and it will, in all probability, be rejected. It is, therefore, thought that the author's very great additional labor in preparing the aforesaid questions to every chapter might have been dispensed with, but the fact that they are there will be an incentive to many to adopt this plan, which the few have long since introduced as essential to correct teaching.

The author of this work of seven hundred and ten pages, including index, modestly terms it a manual. The name is unfortunate, as it presupposes a similarity to a class of books with which all are familiar, mere compends of the subjects treated. To regard this volume in that light would be a grave error, for while the author does not claim to be exhaustive in his treatment, or even wholly original, he has been able to condense every subject so that nothing seems to be lacking to enable the reader to clearly understand the subject.

The repetition of the names of authorities quoted seems to the writer to mar the pages. The names of Senn and Warren grow somewhat wearisome, especially as the subject-matter quoted is generally not original with these authors; in fact, frequently the recognized property of the profession for a long period. In illustration of this, the following sentence is quoted: "Senn says inflammation is not a disease, but a symptom." This the author might very properly have written himself without being called to account for it, as it is a recognized truism in pathology that the phenomena of inflammation is preceded by a cause, the old idea of idiopathic inflammation having no foundation in fact. While the authority of Senn is recognized wherever his works are known, it is rather surprising to find the following quoted for young men

to absorb as part of their mental pabulum: "Senn says, recognizing the fact that acute inflammation, wherever it occurs, is the result of the action of certain specific micro-organisms upon the vessel-walls and the tissues outside of them, the rational treatment would seem to be to destroy the microbes in the tissues as soon as their presence is discovered, by the saturation of the tissues with some solution having germicidal powers." As a germicidal solution would certainly destroy the tissue, it is inconceivable that any one should suggest this as a "rational treatment." If the word inhibit had been used, it might have a decided value, for that is about the extent we can safely go with our antiseptics. The rational treatment in inflammation is to endeavor to remove the cause of these secondary phenomena, if that be possible, which, unfortunately is rarely the case.

The pathology of the book is, in the writer's opinion, of very great value; indeed, we have no work adapted for dental use at all comparable to it, and where oral surgery, so called, is made a part of dental instruction it will become a text-book of first importance. While the writer fails to see the necessity of making a specialty of the surgery of the mouth, as surgery there in nowise differs from surgery anywhere throughout the human organism, it still has become a distinctive part of dental teaching. Hence this book will occupy a place in dental college work not heretofore filled, except by Dr. Garretson's book, which, notwithstanding many defects, must continue to hold a first place in the work which he originated. This is, however, too voluminous for general use: hence this volume is welcomed, and it is hoped the author will avoid the temptation of enlarging it in succeeding editions. It is altogether more satisfactory as it is.

It is not proposed in this review to cover the book in detail. The writer has found repeatedly matter not quite in accord with his ideas, but it would be pure hypercriticism to enlarge upon these in the face of so much good work in other directions. The mere statement of the fact that sixty chapters, covering the entire subject, comprise the contents, will, it is presumed, be sufficient to give an idea of the great labor bestowed upon its production.

It is anticipated that the book will find its way into all dental schools, for it can be recommended as a text-book upon oral surgery without any reservations.

The publishers have prepared this volume with their usual care in regard to type, paper, and general make-up.

The prices are: cloth binding, $6.00; sheep, $7.00.

Anatomy, Descriptive and Surgical. By Henry Gray, F.R.S., Lecturer on Anatomy at St. George's Hospital, London. New and thoroughly revised American edition, much enlarged in text and engravings, both in colors and in black. In one imperial octavo volume of 1239 pages, with seven hundred and seventy-two large and elaborate engravings. Price, with illustrations, colors, cloth, $7.00 ; leather, $8.00. In black cloth, $6.00; leather, $7.00. Philadelphia and New York: Lea Brothers & Co.

It would seem to be a superfluous effort to review a new edition of Gray's Anatomy, so thoroughly has this become identified with the study of the human organism and which for forty years has held, undisputed, a permanent place, but in this new edition, presented by the publishers, there has been given so much that brings the entire work up to the present standard of knowledge, that it comes to us with a renewed confidence that the work will remain the standard for many years to come. The publishers in their note to this edition very truly say, "Anatomy is far from stationary either in facts or improvement in the methods of their presentation; hence any work which would faithfully reflect the existing position of the science must be revised at comparatively frequent intervals."

This work, with index, covers 1249 pages, with seven hundred and seventy-two illustrations, many of which are new, and it would be simply an iteration of a well-known fact to say that the student of anatomy would prefer this book over all others for its broad comprehensive treatment of all the subjects considered. Its greatest claim in the view of the writer has always been its clear elucidation of anatomical problems, bringing each topic treated within the comprehension of the beginner, and at the same time satisfying all the requirements of the most erudite. This is the true mission of all teaching, and books fail, where failure exists, in not meeting this educational demand.

It has been customary in works of this kind to pass over the dental portion in a cursory manner entirely unsatisfactory to the students of dentistry, and it is therefore a gratification to observe that the publishers have, with a recognized liberal spirit, revised and enlarged the chapter on "The Organs of Digestion" by a very full and satisfactory treatment of this portion of the work. This was given in charge of Dr. Burchard, and it adds materially to the value of the book from the dentist's point of observation.

Gray's Anatomy has become so much a part of the educational work of the schools that it would be a superfluous task to enlarge further upon its merits. It is beyond all controversy the one book, above all others, to place in the hands of the student and the one most worthy of continued reference by the practitioners in medicine and the specialties connected therewith.

ZAHN UND MUNDLEIDEN MIT BEZUG AUF ALLGEMEIN-ERKRANKUNGEN. EIN WEGWEISER FÜR AERZTE UND ZAHNÄRZTE. Von Zahnarzt P. Ritter. Mit 20 Abbildungen. Verlag von Fischers Medicin Buchhandlung. Berlin: H. Kornfeld, 1897.

This book has been prepared by the author to fill a special place in the literature of dentistry, that of diseases of the teeth and oral cavity.

The author begins his work with a statement of the present condition of dentistry. After a brief chapter on the action of the mouth bacteria, he takes up the extraction of teeth, and devotes considerable space, very properly, to antiseptics in extraction, giving his method, which does not materially differ from that in common use in this country by all careful operators.

On page 20 he gives an illustration of the danger attending extraction of teeth, in this case resulting in the death of the patient through blood-poisoning.

The author confines his work mainly to diagnoses and therapeutics, varying this only, as in the several chapters on extraction, by giving the proper methods and precautionary measures, together with the preliminary and subsequent antiseptic care in the operation.

In the chapter on Extracting and Filling of Deciduous Teeth this account of teeth at birth is given: "A mother, of thirty-nine years, with two children, gave birth, after an interval of ten years, to a girl who at birth had eight teeth in the superior and inferior maxillæ. The teeth were cusped and firm, but were of a dirty yellow color."

Considerable space is given to Anæsthetics, Fractures, Transplantation, and Implantation.

The author's chapter on Pyorrhœa Alveolaris is neither full nor would the treatment be considered in this country as very efficient, but it has the merit of deeming the disease curable, which some on this side profess to doubt.

Space does not permit the reviewer to follow the pages of this

excellent work. With the exception of Dr. Garretson's work, we have no book that treats as well as this the oral pathological conditions, and there is much here to be desired as the pages are read. It is thought that the author could improve this materially by entering more into detail as to treatment. It seems to the writer that this imperfection impairs its value as a text-book, for the average student demands explicit directions. It is one thing to have a formula for a prescription, and quite another to know the proper manner of using it.

The book, as a whole, must be considered as a valuable addition to the text-books of dentistry, and with American editing and additions would be worthy a place among the text-books in English for use in the schools. It would, however, require very much fuller treatment in many of the divisions than the author has seen fit to give to them.

Obituary.

DR. THOMAS W. EVANS.

Dr. Thomas W. Evans died in Paris on November 15, 1897, of angina pectoris, after twenty-four hours' illness.

Dr. Evans recently visited the United States for the purpose of bringing the body of his wife to Philadelphia for interment. Upon the completion of this sad duty, he made an extended trip through the Middle, West, and Eastern States for the purpose, apparently, of making himself familiar with educational institutions, with the view of enabling him to carry out, intelligently, extensive benevolent projects he had in mind.

Dr. Evans was born in Philadelphia in 1823, in the portion then and now known as West Philadelphia, being west of the Schuylkill River. It is here, the most beautiful portion of the city, that he proposed, it is said, to found a museum of art. It is feared his sudden death may have prevented this and many other of his plans from being perfected, as it is supposed not sufficient time was given him to modify his will.

Dr. Evans received a common school education in Philadelphia, and entered at an early age the gold-and-silversmith shop of Joseph Warner, on Merchant Street of that city, an old three-story brick

house upon the ground now occupied by the Bourse. He and his brother both served the usual time of an apprentice to this calling, and became skilled in the manufacture of delicate silver and gold instruments intended for medical service. The wants of the dentists at that time, the present supply houses not being then known, induced Mr. Warner to undertake the business of supplying silver and gold solder for their use, and he occasionally added other work, but this latter was entirely exceptional, for the writer was quite familiar with the business at this and a later period. At this time, antedating the use of vulcanized rubber, medical instruments of a certain character were made of gold or silver, generally the latter gilded, and it required a marvellous degree of skill to solder some of these without injury.

This work brought the subject of this sketch in contact with dentists, and infused into his young and ambitious mind a desire to study this calling and make it the business of his life. He entered the office of Dr. J. D. White, then the most prominent dentist in Philadelphia, and subsequently he matriculated in Jefferson Medical College.

It frequently happens that the lives that men and women are to lead turn upon trifling incidents, and this was the case with young Evans. His skill as a mechanic enabled him to acquire the art of filling teeth at eighteen years of age superior to the majority of dentists then in practice. He exhibited his work, customary at that day, at the annual exhibition of mechanic arts under the care of the Franklin Institute, and secured a gold medal for his proficiency. The claim was then made that the fillings were inserted in the mouth and the teeth subsequently extracted.

This exhibit attracted the attention of Dr. Brewster, an American dentist of Paris, who eventually secured the services of Dr. Evans. This connection did not last long, for the ambitious young dentist opened his own office in Paris, and from this period the remarkable career, known the world over, began.

The statement made by the press that he was the first to introduce gold filling in Europe has no foundation in fact; that he improved methods then existing is possible and probable. It is very certain that it was due to his efforts that American dentistry abroad received its first impulse towards a character which it has maintained to the present time, through the superior work of many who have followed his footsteps as practitioners in European countries.

His skill attracted the attention of Napoleon III., and he became not only his professional adviser, but a friend. It was through

this friendship for the Emperor that the latter formed the acquaintance with Eugénie, whom he subsequently made Empress of the French nation.

Dr. Evans was a born diplomat, and in that capacity performed essential service, in a quiet way, to Napoleon and to his native country. It is said that through his efforts an open rupture was prevented between the United States and France during the Civil War. His professional connections, and in many instances friendship, with the reigning houses of Europe gave him opportunities for secret diplomatic work, which Napoleon was not slow to accept. His practice may be said to have extended throughout Europe, for he was a frequent attendant, professionally, upon crowned heads and their families. From these he received almost innumerable evidences of their appreciation in the form of gifts and honors, which, in themselves, will make a valuable contribution to the museum which he had in contemplation to establish.

During the Crimean War he was sent by the Emperor, at his own suggestion, to study the sanitary condition of European camps and hospitals, and became so impressed with the misery and suffering there presented that he secured the interest of the civilized world in measures of reform. He was active in the Sanitary Commission during the Civil War, and it was largely due to his influence that the ambulance service during the Franco-Prussian War was placed on the excellent foundation it was at that time and has since continued.

His last service to the imperial family was the well-known assistance he gave the Empress in escaping from Paris. This is not necessary to detail here, but it was one of the most striking incidents of a life not devoid of many worthy of commemoration.

His wealth has been, probably, much overrated. While he had special opportunities for accumulation from practice, dentistry does not permit, even for the most favorably situated, the acquirement of millions. He had opportunities of knowing the changes which Napoleon proposed to make in the effort to beautify Paris and at the same time obliterate streets dangerous in time of revolution. With a keen sense of future possibilites he invested largely upon the lines of new avenues. In this way, mainly, were his large possessions secured.

It is difficult to reach conclusions as to Dr. Evans's standing as a dentist. That he was skilled in his profession there can be no question, but so are thousands of others. That he aided largely in raising the status of dentistry in Europe is certain; but it was

through his personal qualities rather than from any active work in advancing its real interests. The only important service rendered, that the writer is aware of, was the active interest he took in the introduction of rubber as a base for artificial dentures. He published several books under his name, but beyond these he is almost unknown in dental literature or in dental scientific research. It is not given to every man to do this kind of work, and yet Dr. Evans performed a service that challenges recognition. He began his dentistry when, as he expressed it, "It was in the mire," and he left it an honored profession in all lands. His dignified character as a practitioner, combined with special advantages, aided in this work. In this direction he did more than the majority of dentists in his day and generation. This will, however, be his principal monument in dentistry, unless he has managed to arrange, prior to his death, for the great school of dentistry which seemed to occupy his mind when in this country.

The writer of this had the pleasure of meeting Dr. Evans a few days before he sailed for Europe. He was then full of life and energy, and the announcement of his death came with a shock usually accompanying all such sudden departures.

He leaves no children, but a large number of relatives in Philadelphia and elsewhere. Whatever may be the final distribution of his wealth, he will leave to dentistry the memory of a faithful exponent of its best principles and an example of devotion to its highest interests worthy of an enduring record in its archives.

DR. HARRISON ALLEN.

Dr. Harrison Allen, of Philadelphia, died November 14, 1897, of angina pectoris.

Dr. Allen was born in 1841, and completed his preliminary educational training in the Central High School, graduating in 1856, and subsequently entered the Department of Medicine, University of Pennsylvania, graduating from that institution in 1861. From 1862 to 1865 he was assistant surgeon in the army, being stationed principally at Washington, D. C. He held the rank of brevet-major in 1865.

When Dr. George A. Wood established the Auxiliary Department of Medicine in the University of Pennsylvania, Dr. Allen, then twenty-four years old, was called to the chair of Comparative

Anatomy and Zoology; his previous work in the Smithsonian Institution having impressed Dr. Wood with his ability. From 1866 to 1878 he was professor of Anatomy in the Philadelphia Dental College. In the year 1878 he was offered and accepted the chair of Physiology in the Department of Medicine, University of Pennsylvania. He resigned this in 1883. He was visiting surgeon of the Philadelphia Hospital from 1874 to 1878, assistant surgeon at Wills Eye Hospital from 1868 to 1870, and at St. Joseph's from 1870 to 1878. In 1894 he was made director of the Wistar Institute of Anatomy, founded by Dr. Isaac J. Wistar, and continued in this position until 1894. Dr. Allen enjoyed a large practice as specialist in diseases of the throat and lungs.

While he thus occupied positions of great responsibility, it was through his original research that he acquired an assured position as an authority in scientific circles. A warm personal friend of Professors Leidy and Cope, he possessed, in common with these distinguished men, an indefatigable determination to reach absolute truth in his particular domain of investigation.

His writings cover many subjects, having written about a hundred monographs, papers, and books on many phases of medicine. Among them are "A Monograph on the North American Bats;" "Outlines of Lectures on Comparative Anatomy;" "Studies in Facial Region;" "On the Life Form in Art;" "System of Human Anatomy;" "The Stage of the Development of the Bat," and "Clinical Study of the Skull." His works on the diseases of the nose and throat, of which he is one of the most eminent of specialists, are very numerous.

He was a member of many learned societies in and outside of medicine.

Dr. Allen's death at a comparatively early age has cast a shadow over scientific circles in Philadelphia, for the losses there have been very heavy in the past two or three years.

His funeral took place November 17, from his residence, and was attended by a large concourse. His body was incinerated at the Germantown Crematory in accordance with Dr. Allen's previously expressed desire.

Current News.

PROGRAMME OF THE ROCHESTER DENTAL SOCIETY, SESSIONS OF 1897-98.

October 19, 1897.—Office of Dr. B. S. Hert; essayist, Dr. W. W. Belcher; subject, "The Laboratory." Discussion, headed by Dr. W. W. Smith and Dr. J. H. Beebee. Office incidents, headed by Dr. L. Requa.

November 16, 1897.—Office of Dr. R. H. Hofheinz; essayist, Dr. F. J. Woodworth; subject, "Advice to Patients." Discussion, headed by Dr. F. L. Sibley and Dr. L. Requa. Office incidents, headed by Dr. J. S. Furner.

December 21, 1897.—Office of Dr. C. T. Howard; essayist, Dr. C. H. Nicholson; subject, "Temperament as Indicated by the Teeth." Discussion, headed by Dr. I. C. Edington and Dr. W. A. White. Office incidents, headed by Dr. B. S. Hert.

January 18, 1898.—Office of Dr. C. F. Howell; essayist, Dr. W. H. Barr; subject, "New Remedies and Methods." Discussion, headed by Dr. F. J. Woodworth and Dr. L. H. Gilbert. Office incidents, headed by Dr. F. M. Rood.

February 15, 1898.—Office of Dr. J. E. Line; essayist, Dr. R. H. Hofheinz; subject, "Cements and Gutta-Percha." Discussion, headed by Dr. C. T. Howard and Dr. F. H. Lee. Office incidents, headed by Dr. W. A. White.

March 15, 1898.—Office of Dr. H. S. Miller; essayist, Dr. J. E. Line; subject, "Pathological Changes in the Dental Pulp." Discussion, headed by Dr. F. French and Dr. B. S. Hert. Office incidents, headed by Dr. W. A. Windell.

April 19, 1898.—Office of Dr. C. H. Nicholson; essayist, Dr. J. W. Cowan; subject, "Gold and Alloys." Discussion, headed by Dr. J. H. Beebee and Dr. L. H. Gilbert. Office incidents, headed by Dr. R. Erler.

May 17, 1898.—Office of Drs. J. and L. Requa; essayist, Dr. F. A. Greene; subject, "Fracture of the Superior and Inferior Maxilla." Discussion, headed by Dr. H. S. Miller and Dr. J. Requa. Office incidents, headed by Dr. P. H. Smith.

June 18, 1898.—Office of Dr. J. W. Cowan; essayist, Dr. C. F. Howell; subject, "The Year's Advancement in Dentistry." Discussion, headed by Dr. C. H. Nicholson and Dr. H. N. Holmes. Office incidents, headed by Dr. F. L. Sibley.

NORTHERN ILLINOIS DENTAL SOCIETY.

To the President and Members of the National Dental Association, and of the National Association of Dental Examiners.

Gentlemen,—At the Tenth Annual Meeting of the Northern Illinois Dental Society, held at Rockford, Ill., October 20 and 21, 1897, the undersigned were appointed a committee to draft and present to your Associations suitable resolutions with a view to remedy an existing evil regarding the interstate practice of dentistry, and we herewith submit the following for your consideration:

Whereas, A legal practitioner of any one of the United States, who desires to remove to another State, is, under the existing laws, compelled to comply with certain requirements of the dental law of that State; and

Whereas, In many instances such legal practitioner (sometimes of many years' experience) is subjected to a more or less severe theoretical examination, which cannot even be successfully passed by many who are fresh from the college halls; therefore be it

Resolved, That the National Association of Dental Examiners and the National Dental Association be, and are hereby requested to enact such rules, or to secure such modification of the dental laws of the various States which, under reasonable restrictions, will enable competent practitioners to remove from one State to another without being compelled to submit to provisions which are eminently unfair to a large number of capable dentists.

Louis Ottofy,
W. N. Taggart,
M. L. Hanaford,
Committee.

Attest:
James W. Cormany, *Secretary.*
Dated, November 10, 1897.

The following are the officers of the Northern Illinois Dental Society for 1898:

President, C. B. Helm, Rockford; Vice-President, Louis Ottofy, Chicago; Secretary, James W. Cormany, Mt. Carroll; Treasurer, M. R. Harned, Rockford.

Executive Committee.—E. J. Perry, Chicago.

James W. Cormany,
Secretary.

Selections.

CARIOUS TEETH AS A MEANS OF ENTRY INTO THE BODY FOR THE BACILLUS OF TUBERCULOSIS.

Dr. Starck, of Heidelberg, has reported two cases that clearly show that a decayed tooth may be the point of departure for the invasion of the organism by the bacillus of tuberculosis. In the first case, a young man after a violent toothache had enlargement of the submaxillary lymphatic ganglia on the same side as the affected teeth,—the left lower molars. During the three months following the tumor increased to the size of the fist, painless, irregular of surface, soft and elastic in parts. On the *right* side there was slight enlargement of submaxillary and subclavicular glands, and prolonged expiration in upper lobe of lung. The teeth were extracted, and the tumor, which was in a state of caseous degeneration, was removed. Microscopic examination of the teeth showed numerous bacilli of tuberculosis. The second case, in a girl of fourteen, was very similar. Large numbers of bacilli were found in the extracted tooth. In three cases resembling these two in their clinical aspect, bacilli were demonstrated in the cervical glands, but none could be detected in the carious teeth.

The author believes that not only tubercle bacilli, but also other pathogenic microbes can penetrate the body *via* decayed teeth.

Dental caries appears to be also the most common cause of ordinary chronic lymphadenoma in infants. In one hundred and thirteen cases of infants with enlarged submaxillary ganglia no other cause could be determined in forty-one per cent. of the cases. We see from this the extreme importance of hygiene of the mouth, from the point of view of prophylaxis, during the early years of life.—*Reported in La Revue Médicale, May 23, 1896.*

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